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Ketchum's Patent for enabling Locomotives to ascend Inclined Planes.

We have examined the model of Mr. W. D. Ketchum's Wheel and Rail, at present in this city. The inventor claims, as its chief advantages, simplicity of construction and saving of time.

It consists simply of a wheel with a wedge-shaped groove, fastened outside of the driver and on the same axle. These wheels are smaller in diameter than the driving wheels, and the dimensions are regulated by the inclination to be overcome.

When the Locomotive reaches the foot of the inclined plane, the outer wheels run upon a rail prepared to receive them, and which is raised so much above the other rail as just to clear the usual driving wheels from it. It must be evident, in this case, that the gain of power is in proportion as the outer wheel is smaller in diameter than the usual driver.

The inventor conceives that the peculiar shape of his wheel promotes adhesion, so that the gain in power is not lost by a slipping of the wheels.

It is very evident that any means for overcoming high grades without assistant Locomotive power, must add materially to the capability of Railroads, and admit of their being constructed in situations, whereas without such means cutting to a lower grade would be impossible, and the road impracticable.

The inventor possesses the testimonials of many engineers as to the usefulness of his invention. It appears that calculations have been made showing an immense gain to the Erie Railroad, and other companies, from the use of this contrivance. Certainly a matter of so much importance should speedily be put to the test of a trial on a large scale.

Important to Railroad Companies and Car Builders.

Mr. P. Alverson, of New Haven, Conn., has lately invented a new and useful improvement in the mode or method of attaching Railroad Cars to each other, and to the moving power, of which we are in hopes to give a more full description in our next number. The object of his invention is to prevent the jerk usually experienced on the first movement of the Cars, and the jar occasioned by the concussion when suddenly stopped. He has also, in addition, constructed a Connecting Link in such a form so as to keep the Cars in a regular motion each way, and do away with the bumpers, so called, to save much cost and expense. This Link is also constructed, so that when one Car is thrown from the track, it will disconnect, and not take any more with it. From what we have seen and heard of his improvement, (which he is now applying to the Hartford and New Haven Railroad Cars,) we think it a valuable improvement for the benefit of the Locomotive Cars, and safety of passengers, and would recommend it to all Railroad Companies and Car Builders. It costs but little (compared with the benefit of it, and safety to passengers) for each Car; it is easily applied, and not liable to get out of order. His intentions are to visit the different Roads in the United States with a sample of his improvement, and hopes it will meet the approbation of all concerned in Railroads.

Atlantic Steam Navigation.

We put on record the following notice from our daily papers, conceiving that it is the commencement, under auspicious circumstances, and in the right way, of an undertaking likely to prove as profitable as creditable to the country.

We have been surprised that something of the kind has not been done before, but the truth is, we are so inclined to boast of our peculiar advantages, that we often suffer them to lie neglected. The success of such an enterprise, properly undertaken and skilfully conducted, is as obvious in a professional as in a mercantile point of view.

We wish all manner of success to the first *American Atlantic Steam Navigatiion Company.*

An adjourned meeting was held at the Carlton House on Thursday, the 16th October, to receive the report of a Committee appointed at a previous meeting, at which James Boorman, Esq., presided, on the subject of Atlantic Steam Navigation.

J. DePeyster Ogden, Esq., was called to the chair, and Archibald Gracie, Esq., appointed Secretary.

The report of the committee adverted to the highly successful results which had attended the incipient steps of this great enterprise, both in a

scientific and commercial point of view, as affording increased facilities of intercourse by a more speedy and definite mode of communication than had hitherto been accomplished, even by the excellent lines of packet ships, which have been so long and so deservedly in successful operation.

Among other views presented by the Committee it was submitted as their opinion, that if a regular intercourse by means of steam had existed between the United States and Great Britain two years ago, most of the difficulties and disasters of the late commercial crisis might have been greatly mitigated, and many perhaps, altogether prevented.

A statement of the large profits to be derived from such an enterprise was submitted to the meeting by the committee, showing that in calling on their fellow-citizens, to unite in the accomplishment of so beneficial a result, their expectations of success were not founded on theoretical calculations, but on those derived from practical experience.

The following resolutions were then unanimously adopted:

Resolved, That it is expedient to form a Company in this city, to be called the "American Atlantic Steam Navigation Company," and to obtain an act of incorporation, with a view of building a steam ship or ships to navigate the ocean.

That the interests of this State and City, and the maintenance of that high standing for commercial energy and enterprise which has hitherto characterized it, call loudly upon our citizens, whose waters were first successfully navigated by steam, to assist in applying this immense engine of power to the navigation of the ocean.

Resolved, That a Committee of twelve be appointed to obtain subscriptions and further the objects in view, and that they be authorized to call a meeting of the subscribers at such time as they may deem expedient.

Resolved, That the following gentlemen compose the Committee:

Jas. D. P. Ogden,	Esq.,	Capt. James Rogers,	
John H. Hicks,	"	Henry Smith,	Esq.
Archibald Gracie,	"	Moses Taylor,	"
James Boorman,	"	Hamilton Murray,	"
Elihu Townsend,	"	Robert Schuyler,	"
James Lee,	"	Joseph Fowler,	"

Estimates of the cost of a steamer of 2000 tons and upwards, with machinery complete, to be constructed at New-York, were laid before the meeting, and subscription lists with the following heading have been prepared and are in the hands of the Committee:

ATLANTIC STEAM NAVIGATION.

The subscribers hereby declare their readiness to take stock to the amount opposite their names respectively: in shares of $500 each, in a company to be incorporated in the city of New-York, for the purpose of navigating the ocean by steam, in pursuance of the proceedings at a meeting held on the 16th day of October, as published in the daily papers of the 27th inst.

Dated New-York, 27th October, 1838.

J. DePeyster Ogden, Chairman.

Archibald Gracie, Secretary.

New-York and Albany Railroad.

"We observe the appointment of *Edwin F. Johnson, Esq.*, as Chief Engineer on this road. This appointment is indeed auspicious of success. Mr. J.'s abilities are well known in this part of the State, which derived no small advantage from his skill both as an Engineer, and as a lucid and vigorous writer. Mr. Johnson's professional rank is now among the first Civil Engineers in the United States. He has probably no superior. His connexion with the New-York and Albany Railroad will greatly contribute to the establishment of public confidence, and we shall rejoice to see the work in a course of actual prosecution."—*Oswego Palladium.*

We most cheerfully give our assent to the above tribute to the talents of Mr. J., and heartily congratulate the New-York and Albany Railroad Company on having secured the services of a gentleman so distinguished in his professional reputation, and by his appointment the still higher regard of the public, already sternly in favor of this important work.

Hiwassee Railroad.

Knoxville, Tenn. September 25, 1838.

GENTLEMEN—The grading of the Hiwassee Railroad is progressing rapidly. Owing to our isolated position, the derangement of the money market has had comparatively but little effect upon us, having at no time obliged us to suspend, or even materially to contract, our operations. The whole extent of the road from Knoxville to its connexion with the Georgia Railroads, at the division line of Tennessee and Georgia, (98½ miles) is now under contract. Nearly the whole of it has been taken by Mr. Kennedy Lonergan, a well known northern contractor; and it affords me much pleasure to add mine, to the many certificates he already possesses, of ability, energy, and faithfulness in his business, Our operations are just now confined to the 41 miles of road lying between the rivers Tennessee and Hiwassee; which will probably be ready for the rails this winter. The lower 25 miles of the road, being that portion which extends from the Hiwassee River, at Calhoun, to our junction with the Western and Atlantic Railroad of Georgia, at the Georgia State line, lies entirely within the Cherokee Country. The occupation of this district by the Cherokee nation, now concentrated there for removal, and by the military forces under General Scott, who is directing the removal, has so increased the scarcity and prices of provisions, that it is impossible for the contractor to procure subsistence for his men. The energetic measures of General Scott, will, however, in a few weeks relieve us from that impediment, and enable me to put heavy forces to work along that portion of the line. I expect to have 66 miles, extending from the Georgia line northward, ready for the rails, within twelve months from this time; and as Colonel Long will have, *at least*, an equal extent of the Western and Atlantic Railroad finished from the same point, southward, we shall have completed a continuous line of 132 miles; by which means both roads will be rendered available much sooner than they could otherwise be.

From the lower termination of the Western and Atlantic Railroad other Railroads are in progress by which, within three years, we shall have opened direct communications from Knoxville to Charleston, Savannah,

Mobile, and New Orleans. These several lines present the unprecedented fact of *more than* 600 *miles of connected Railroads, no where encumbered by grades exceeding* 36 *feet to a mile; nor by a single curve, of a radius less than* 1000 *feet; and at the same time entirely free from tunnels and inclined planes.* No portion of this immense extent of Railroad is liable to interruptions from the frosts, snows, and ice of winter; therefore, *even on the most objectionable parts*, a good locomotive will, with ease, draw as its usual load, 150 tons of freight, or 500 passengers; and with these loads the entire chain may be travelled with no other limitation of speed, than what experience has shown to be conducive to safety, and to the preservation of the road. Fortunately, too, each separate road has the same maximum grade (differing on none I believe more than 3 or 4 feet); from which circumstance, a wonderful regularity of business may be maintained. There is scarcely a doubt, that the Legislature of Virginia, will at its next session, authorize the construction of a Railroad from Richmond to the Tennessee line, near Blountville; if so, Tennessee will continue the Hiwassee Railroad northwardly, to the same point, a distance of but 125 miles; and then will be effected the "consummation so devoutly to be wished for"—*a continuous Railroad from Boston to New Orleans.* I am, very respectfully, yours, &c.

JOHN C. TRAUTWINE.

Second Annual Report of the President and Directors to the Stockholders of the Louisville, Cincinnati and Charleston Railroad Company—September, 1838.

In submitting their second annual report, the Board are gratified in being able to state that they have accomplished most of the objects to which their attention was directed by the Stockholders, at their general meeting in October last. The Charleston Railroad, which they were instructed to purchase, has been obtained on the terms proposed—that is to say—at 25 per cent. advance on the first cost of the shares—the purchase money being payable, one-third in cash, and the balance in one and two years. The sum agreed to be paid for this road does not exceed its actual cost to the Stockholders, or its value to us. By this purchase, we have secured a road, *ready made to our hands*—136 miles in length, extending from Charleston to Hamburg, on the Savannah river—opposite to Augusta in Georgia, where it meets the Athens Railroad, through which it will finally be connected with all the improvements now going on in Georgia and Alabama, and thus command to a very great extent the trade of the South and South West. The Charleston and Hamburg Railroad is undoubtedly destined to be *The Great Highway* between the North and the South, and South West. By means of the Wilmington Railroad, extending from Wilmington in North Carolina, to Halifax on the Roanoke river, of which upwards of 60 miles are already completed—a continuous line of Railroad and Steamboat communication will be furnished from Wilmington to Boston. By this route, a traveller leaving Charleston, will be able to reach Washington in two days, New-York in three, and Boston in less than four days. To travel from Augusta in Georgia to New-York, a distance of 800 miles, will require no more than four days; and when the projected Railroads in Georgia and Alabama shall be completed, it will be entirely practicable to travel from the Gulf

of Mexico, or even New-Orleans, to Boston in less than a week.* The Charleston and Hamburg Railroad will constitute one of the most important links in this line of communication, and if, with its present limited connexions, upwards of 100 travellers are conveyed upon it daily, and its daily receipts exceed $1 000, we may reasonably anticipate, that the time is not distant, when these will be increased to an extent which will exceed any calculation we would now venture to make. To our Company, however, the purchase of the Charleston and Hamburg Railroad, was even more important than this view of the subject would indicate. The Stockholders had decided that a grant of banking privileges was indispensable to the success of the great enterprize, and liberal charters had accordingly been obtained from the States of North and South-Carolina. These, however, had been granted on the express condition that *three States* should concur therein *and*, that the subscription to the Road should be increased to eight millions of dollars, on or before the 31st of December, 1837. At the meeting of the Stockholders in October last, the whole subscription amounted to about $5,300,000; and in order to secure the Bank Charter, it was necessary that either Tennessee or Kentucky should be induced to concur in the grant, which had been made by the two Carolinas, and *also*, that $2 700.000 should be added to the subscription before the end of December. The President having repaired to Nashville, obtained the consent of the Legislature of Tennessee to the Bank Charter, (though the application to Kentucky unfortunately failed,) and also procured a subscription on the part of the State of Tennessee to the amount of $650,000. But still upwards of *Two Millions* of dollars remained to be subscribed in the short space of three weeks, which could not possibly have been obtained in any other way than by the purchase of the Charleston and Hamburg Railroad, which was made on the condition that a subscription should be made in behalf of the Stockholders in that Company, for 20,000 shares in our Company, the first payment on which was to be deducted from the purchase money. This left a deficiency of only $50,000; which was promptly, and liberally made up by the city Council of Charleston; and *the Bank Charter was thus secured*; which confers upon the company privileges of such inestimable value, that no doubt can be

* That these calculations are not extravagant, will appear from the following statement. By the Steam Packet Boats leaving Charleston at 5 o'clock, P. M., passengers are enabled to reach Wilmington the next morning to breakfast. From Wilmington a Railroad has been laid out, and is now in a course of rapid construction, to Halifax on the Roanoke River, a distance of 160 miles. Of this, 60 miles are finished and in use; and it is expected that in December there will be 110, when but 50 miles will remain unfinished. When completed, the distance will probably be run in 10 or 12 hours. At Halifax, we find two Railroads, one extending to Norfolk, and the other to Petersburg, Va. At Petersburg we fall upon the Railway extending through Richmond to Fredericksburg. Here we travel, *at present*, in stages 9 miles to Potomac Creek, though it is in contemplation immediately to extend the Railroad to the Potomac, at or near that point. Here we take a steamboat to Washington, which is reached in five hours, and will be reached in half that time, when the Fredericksburg Railroad shall be extended to Alexandria. Leaving Washington at 6 o'clock in the morning, we may even now actually arrive at Boston by 8 o'clock the next morning—a distance of 400 miles. We reach Baltimore in two hours and a half, arrive between 12 and 1 o'clock at Philadelphia, in time to take the New-York cars or steamboats, which arrive at that city by 6 o'clock the same evening. There, by going immediately on board of the steamboat for Stonington, we are carried to that place by 3 o'clock next morning, where by the Stonington, Providence and Boston Railroads, we are enabled to reach Boston by 8 o'clock, making in all 26 hours from Washington. Such are the facilities afforded by Steamboats and Railroads on these routes, facilities which will be greatly increased, should a Railroad be extended from Wilmington to the Waccamaw river, and from Georgetown to Charleston.

entertained, that under a judicious management they may be made to yield full dividends on the whole investment, both in the Road and the Bank,—furnishing at the same time the means for making the Road. We know that this has actually been effected in an adjoining State, through the instrumentality of a State Bank of very limited capital and circulation—what may we not expect therefore from an Institution incorporated by three or four States, and a circulation at least co-extensive with their limits? But these were not the only advantages to be secured by the purchase of the Charleston Railroad. That Company enjoyed the exclusive privilege of making a Railroad from Charleston to Columbia (which, however, they were not yet prepared to execute,) and difficulties were apprehended in the attempt to form a junction with them—difficulties which had been experienced elsewhere under similar circumstances, and which were forcibly presented to the Stockholders at their last general meeting, in the "Report of the Committee of Thirteen." To obviate all of these difficulties—to secure to ourselves the valuable privileges of the Charleston company, and at the same time to obtain possession of a Road already made, and not only valuable in itself, but especially valuable to us, as furnishing for upwards of sixty miles from the seaboard, a Railway of which we could avail ourselves in the extension of our Road through the centre of South-Carolina, thus forming the first great link in the proposed connection between the South and the West—were objects of the last importance. Availing ourselves of these advantages, the Board of Directors have, since the purchase, caused the Road to be located (in the construction of which great progress has been already made,) from Branchville,) a point on the Charleston Road, 60 miles from that city,) to Columbia, the Capital of South-Carolina, from which place it is proposed to extend our *main trunk*, through the centre of South-Carolina, across the Butt Mountain Gap in North-Carolina, and thence along the valley of the French Broad River, to Knoxville, (Tenn.) from whence it will be carried to Lexington, Kentucky, and eventually, we trust, to the Ohio and Mississippi Rivers—by as many routes as the interests and the convenience of the people of the Western states may require. Though several routes have been surveyed between Columbia and the Mountains, and also between Knoxville and Lexington, all of which have been found entirely practicable; it has not been deemed proper to proceed to the *location* of any part of the Road above Columbia. As a general principle, it is deemed wise and prudent to progress step by step from the sea coast towards the interior, and not to attempt simultaneously the construction of detached and independent sections which would be comparatively useless until the whole is completed. Nothing, it is believed, would tend more directly to impair public confidence in the success of our great enterprize than the attempt to commence operations at once along the whole line. In all great undertakings the concentration of force upon a few points, has been found to produce the most decisive results; and we believe that the experience of every state in this Union, has proved that failure has generally attended those schemes of internal improvement, which have been conducted on the principle of attempting to conciliate all interests, by prosecuting at the same time, with limited resources, an extensive system of Roads and Canals, embracing complicated and diversified operations. In our case, this danger was intended to be guarded against by a provision of the charter, that the funds subscribed in any state should, at the discretion of the Directors in that state, be first applied to the construction of the Road within the limits of such state. As there-

fore the funds subscribed in the other states, could not be applied to the making of the Road in South-Carolina, no objection could exist on the part of those states to the plan adopted, of proceeding step by step, from the ocean towards the mountains—which is the only safe and practicable scheme; and it was taken for granted, that in none of the other states could the Directors consent to any application of their own funds, but such as would in every possible event enable them to reap the fruits of their expenditures. By adhering to this plan, instead of expending vast sums of money on detached portions of the Road, from which no income could be expected, until the whole work was completed, we shall be enabled, with comparatively limited expenditures, to *finish and bring into use*, successive links in the great chain of communication—thereby furnishing, at every step, additional inducements for the further prosecution and gradual extension of the work. By pursuing this system, aided by the bank, we may hope, in a short time, to give to all our Stockholders full dividends on the capital invested, with the prospect of a regular increase of the dividends as the Road may advance—whereas by commencing operations simultaneously at detached points along the whole line, no such results could be expected, while the constant demands upon the Stockholders for carrying on such extensive operations, would serve to discourage them, until seeing no prospect of immediate returns, they might be tempted to forfeit their stock, and abandon the enterprise in despair. In further illustration of the advantages of the system here recommended, we would suggest, that it seems to give the best possible security for the eventual completion of our great work. When the Stockholders shall clearly perceive, that we are proceeding on a plan which must render profitable whatever sums they may invest, they will have the strongest inducements to comply with all the requisitions that may be made upon them. When one section of the Road shall be finished, and brought into successful operation, a sure foundation will be laid for the construction of the next, and thus we shall advance, step by step, and as rapidly as our means may permit, to the final consummation of our work, securing, as we progress, the fruits of our enterprize. Let us suppose that, proceeding on this principle, the Road shall in a short time be extended from Charleston to Columbia, and be put in successful operation for a distance of 128 miles. Encouraged by this success, the company would certainly be anxious to extend it from that point across the mountains, while the people living in the intermediate districts, would naturally strain every nerve to effect this extension as soon as possible. We are perfectly satisfied that they would, if necessary, by their own unaided efforts, make this portion of the Road. *Once carried across the Mountains, the Road will make its own way.* We may safely rely upon the citizens of North-Carolina, Tennessee and Kentucky, aided as in the end they must be, by their respective states, for the gradual though certain extension of the Road to the Tennessee and Ohio rivers, whenever the work shall be brought within their reach. When, by the construction of a comparatively short section of the Road, within their own limits, the people of any state shall find that they can avail themselves of a continuous line of Railroads to the Atlantic ocean, and that too by the *shortest and cheapest route*, the ordinary principles which control the action of communities as well as of individuals, must have lost their influence, should they *then fail* to put forth the efforts necessary to secure this inestimable advantage. We are satisfied, therefore, that the first step in our great enterprize, viz: the successful execution of the work now in a course of construction between Columbia and Charleston, will,

(with the possession of the Charleston and Hamburg Railroad, and the establishment of the Railroad Bank) ensure, in the end, the extension of the Road to the navigable waters of the West. At every stage in our progress, however, let our eyes be constantly fixed on this extension, as the consummation of our great work. Let us never forget, that to bring the South and the West together, is the end at which we aim, and while proceeding gradually, let us advance steadily toward that object, firmly resolved to do all that may be in our power, for its certain and speedy accomplishment. Let the bank be at once established, with branches in North Carolina and Tennessee, and let our whole course of conduct manifest a fixed determination on the part of the Stockholders in all the states to act harmoniously together—governed by common councils, directed to common objects—and, under the influence of enlightened and liberal views, pressing forward in full confidence that a wise policy steadily pursued, will, in the end, crown our labors with triumphant success. We do not wish to be understood by any thing we have here said, as intending to discourage the commencement of the work, in any of the other states, at points where there may be sufficient reason to believe it can be completed, within a reasonable time, and where, when finished, it can be rendered useful and profitable of itself. These are points that must be left to the judgment of the Directors and Stockholders in each state. But whenever and at whatever points such works may be commenced, it is deemed important that the principles above indicated, should be observed in their prosecution, and that the rule should be invariably adhered to of husbanding our resources, and making our foundation sure, before we proceed to erect the superstructure.

In looking to our resources for carrying on this work, it should be borne in mind, that the purchase of the Charleston and Hamburg Railroad must necessarily consume a large portion of our funds for some time to come; and if at the expiration of one or two years, from the commencement of the enterprize, we shall have accomplished no more than to have paid for that Road, and constructed our main stem to Columbia, more will then have been effected, than has ever been performed in this or in any other country, by any single company in the same space of time. We shall then be in possession of a Railroad *two hundred miles in extent*, twice as long as any single Railroad now existing in the world, and which will have been completed in half the time usually occupied in such works. To accomplish this however, will require the exertion of our best energies—the calling into requisition all our resources, and the application of all our means.

It has been shown, that the price of the Charleston Railroad was $2,400,000, of which $1,600,000, will have become due by the 1st of January next. In addition to this, the completion of the repairs and improvements on that road, including the embankment and new iron repairs of engines, cars, &c., may be estimated at about $300,000. The construction of the Branch at Columbia, on the most approved plan, will cost (as estimated by the chief engineer,) $1,500,000 making in the whole $4 200,000, for a considerable portion of which, provision must be made in the course of the ensuing year. The Directors, in carrying into effect the instructions of the Stockholders, for the purchase of the Charleston and Hamburg Railroad, were so fully aware of the impracticability of making calls, for the amounts necessary for that object, that they resolved not even to attempt to make the purchase, (essential as that purchase was to the accomplishment of our objects,) unless the guaranty of the state of South Caro-

lina, could be obtained for a loan of two millions of dollars. This, however, having been fortunately secured, it was believed that the purchase might be safely made. Should Gen. Hamilton, who has been sent as our agent to Europe, for that purpose, be enabled to effect this loan, as is confidently expected, we shall then have at our disposal the following means to meet our engagements, and to carry on the work, viz :

Amount of the first loan, - - - - - -	$1,000,000
Balance of cash on hand, (according to the Treasurer's Report,) - - - - - - - - - -	150,000
Making together the sum of, - - - - - -	$1,150,000

This sum will be applicable in the first place, to the payment of $350,000, due to the Banks in Charleston, being one half of the amount borrowed from them, to meet the cash payment on the purchase of the Charleston Railroad. There will also be required to meet the contracts for the construction of the Road between Branchville and Columbia, and the other current expenses of the company, up to the 1st January next, about $100,000, to which about $80,000 may be added for carrying on the repairs and improvements on the Charleston Road, the surveys, &c., up to the same period, making in the whole, $530,000; which being deducted from the means at our disposal as above, would leave a balance on the 1st of January next, of $620,000, which would be applicable to the payment of the 2d Instalment of $800,000, (with interest on the whole debt,) which will on that day become due to the Stockholders of the Charleston and Hamburg Railroad Company, amounting in the whole to about $900,000. It will be perceived then, that there will be a deficiency of near $300,000 of the amount necessary to meet our engagements on the 1st of January. This amount can only be supplied by calling for another instalment on the stock, or by making a temporary loan, until the 2d million can be obtained from Europe. Should Gen. Hamilton succeed in making a conditional arrangement for this loan, the money cannot be obtained according to the terms of the Act of the South-Carolina Legislature, until another instalment shall be called in from the Stockholders. This may be safely done in the spring of the next year, provided the Bank can in the mean time be put in operation. It is not believed, that it would be expedient to make any further calls upon the Stockholders until, by the establishment of the Bank, a fixed value shall be given to their stock. A temporary loan, therefore, to meet the demands upon the company, which will become due on the first of January next, seems to be the best expedient that can be devised. We can offer as security for such a loan ten thousand shares in the Charleston and Hamburg Railroad, whose par value is *one million of dollars*, which shares are now pledged to secure the payment of the $800,000, due in January next, but which will be released on the payment as above proposed of that sum, with the interest on the debt. It may be hoped that no serious difficulties will be experienced in effecting a loan of so much money, as we may require, say $500,000, on this unquestionable security, and if so—we shall have on the 1st of January next, a balance of $200,000, after paying all demands, and which will be applicable to the general purposes of the company. In extending our views still further, to the entire operations for the ensuing year, it will be found indispensably necessary that an instalment of $5 on each share should be called for early in the course of

that year. This we may assume to amount to		$800,000
The second loan, which may then be effected, will amount to		1,000,000
Making together,		$1,300,000
The balance of the debt now due to the Bank must be paid, say	$350,000	
The temporary loan above mentioned, must also be paid, say	500,000	
Making together,	$850,000	850,000
Which deducted from the above, would leave a balance on hand of		$450,000

On these payments being thus made, we shall moreover be left in possession of ten thousand shares in the Charleston Railroad company, worth at least a million of dollars free from all incumbrance, which, with such additional instalments as may be called for from the Stockholders, will constitute the means for carrying on the work—and would be adequate to that object. When the repairs and improvements on the Charleston Road shall be completed, we may reasonably expect to derive an income, from that source, but this must of course be divided among the Stockholders, and cannot be diverted to any other objects. It may not be necessary at present to look to any other resource, than the additional 10,000 shares, mortgaged to the Stockholders of the Charleston Railroad company, to obtain the means of paying the 3d instalment, which will become due on the 1st of January, 1840. But to carry on the work to the extent proposed, so as to finish the road to Columbia, early in 1840, will require a call for two or more instalments in the course of the ensuing year. Should our Bank, however, go into successful operation, no difficulty need be apprehended, from making the necessary calls, especially when the amounts called for, will be applied to securing a valuable Railroad property, to be put to immediate and profitable use, and from which dividends may be soon expected. Indeed, it could hardly be doubted, that the establishment of the Bank, and the completion of the Road to Columbia, with the possession of the Charleston Railroad, will lay a sure foundation for the entire success of our great enterprize. We will not even anticipate as probable, the failure of our negociations for a loan of two millions of dollars in Europe. We know that this important negociation has been entrusted to able and faithful hands, and therefore have every reason to rely with entire confidence on the success of an application made by a company incorporated by four states, under the guaranty of the state of South Carolina, whose credit is certainly equal to that of any state in the Union. In the calculations and statements above submitted, we have not aimed at minute accuracy. It is sufficient for our purpose to give the Stockholders a general view of the financial condition of the country—of our resources, and prospects, and the measures necessary to be adopted for the successful prosecution of the work. The Report of the Treasurer, and the chief Engineer, will furnish all the details that may be required.

But we consider the establishment of the Railroad Bank, as *the bond* which will serve to hold the Company together, and afford a certain resource in every time of need, and therefore as essential to the success of our great work. In this view of the subject, we would call the atten-

tion of the Stockholders to some of the leading provisions of our Bank Charter, and briefly point out the great advantages that may be derived from this institution, and the valuable uses to which it may be applied. The "*South Western Railroad Bank*" has been chartered by the States of North and South Carolina, and Tennessee, with a capital not to exceed *twelve millions of dollars*, and for a period of *thirty-one years*. Kentucky has not yet concurred in this charter, but strong hopes are entertained that the renewed application which is to be made to her Legislature, at the ensuing session, will not fail of success. We are strengthened in this expectation by the favorable disposition manifested towards our enterprize, at a recent meeting of the Directors at Lexington—by the small majority against the application, at the last session, of only six votes—by the deep interest which Kentucky has in the success of the Road—and especially in the establishment of a Bank, which will so essentially promote the trade and intercourse now carried on by her citizens, with the Southern States. But whether these expectations shall be realized, or not, it cannot be doubted that a bank, extending with its branches over three States, will furnish a currency which must be of inestimable value to the citizens of these States—a currency whose credit would be such as to command an extensive circulation, not only within the States granting the charter, but in the neighbouring States, and to some extent throughout the Union. Furnishing the ready means of transferring funds by drafts and bills of exchange, the South and West will be relieved from what is now felt to be an onerous tax upon their intercourse. This want of a common currency now subjects the trader and traveller, not merely to great inconvenience, but to much positive loss. Gold and silver, though indispensable as the basis of a sound circulating medium, never can, to any extent, be made available for the general purpose of commerce. No traveller or trader will attempt to cross the mountains with bags of specie, while he can obtain drafts or bank bills, which will answer his purpose equally well. In proof of this we will state the fact that on our recent visit to the West, we were unable to convert Southern bank bills, even of specie paying banks, into Western paper, except at a premium of 7 per cent, while Kentucky bank bills could not probably have been rendered available in Charleston without paying an equal amount—thus subjecting the holders of these bills respectively to a charge in a single transfer of funds between Lexington and Charleston, equal to a whole year's interest on the amount. Though this may be regarded as an unusual and extraordinary state of things, we feel warranted in stating, on the authority of several experienced Western traders—that the general condition of the currency, and of the exchanges, subjects the trade between the South and the West to charges which may be safely estimated at six per cent. on the whole amount employed in that trade, which we all know amounts to many millions annually. The South Western Railroad Bank will apply an effectual corrective to this evil. It will thus not only effect a vast annual saving to the traders and farmers of the South and the West, but by so doing will recommend itself to general favor and support, and if conducted on safe, sound, and liberal principles, will, at the same time, ensure large profits to the Stockholders. The failure to renew the charter of the Bank of the United States, has left the Southern and Western States in the condition above described, and from which they never can be relieved, but by the establishment of such a bank as ours. The New-York banks and the Pennsylvania Bank of the United States may furnish the Northern and the Eastern States with a currency suffi-

cient for their parpose. But nothing short of a bank having a charter from several States, can supply our wants. The re-charter of the Bank of the United States must be admitted even by those who deem such measure most desirable, to be more than doubtful, and if it should take place at some future day, would come too late for our purposes. It is believed that from the South Western Railroad Bank, we may immediately realize most of the advantages expected to be derived from a Bank of the United States, without interfering essentially with that Institution, should it be hereafter established. The history of the United States affords no parallel to our bank. Never before have three States concurred in granting any bank charter, and never has so liberal a charter been granted by any State. No bonus is required to he paid to either of the States. The stock, as well as the dtvidends thereon, are expressly exempted from taxation in the State of South Carolina, and substantially so in the States of North Carolina and Tennessee, and the bills of the bank are made receivable at the State Treasuries. While it is declared that the amount of the capital shall not exceed twelve millions, it is left entirely at the discretion of the Stockholders to fix the amount with which they may commence business, which amount they are permitted to enlarge, from time to time, as they may think proper. The only limitation in the exercise of this discretion, is found in the provision that after the two first instalments of $12½ each have been paid, the Directors of the Bank shall not call for any further sums, unless equal amounts shall be called for, on the Road. It will be seen, on referring to the charter that in the present state of the subscription to the Road, (two instalments of $5 each having been paid,) the Stockholders will be entitled to hold bank stock equal to $30, on each share held in the Road, of which $12½ will be payable at the time of subscribing, and the remaining $17½ at such times as may be deemed advisable by the Directors of the Bank. At every subsequent call made for the Road, an equal amount may be called for in the Bank. A subscriber having paid ten dollars on his stock in the Road may therefore hold $30 of stock in the Bank, and at each successive call the amount of stock in the bank will continue to exceed the stock held in the Road by an equal amount, until the Bank capital shall amount to $6,000,000, when they must proceed together *pari passu* until they amount respectively to $12,000,000.

The object of this liberal provision, was to give income to the Stockholders while the Road was in a course of construction, and before any part of it could be made a source of profit. And this object may certainly be fully accomplished, if the Stockholders are only true to themselves. With $30 invested in the Bank, and $10 in the Road, *seven per cent.*, at least, may certainly be realized upon the whole amount of the investment, viz:—$40 Under successful management 10 per cent. can easily be made on the $30 invested in the Bank, which would be equal to 7½ per cent. on $40—the whole amount of the Stock held both in the Bank and the Road—and it is not doubted that as the operations of the Bank shall be subsequently enlarged, even greater profits may be derived, so as to keep up the dividends to at least 7 per cent., until the first division of the Road shall be finished, and brought into use, when the income of the Stockholder must be considerably increased.

Such are the important Banking privileges which have been conferred upon the Stockholders of the Louisville, Cincinnati and Charleston Railroad Company. No one is allowed to hold a share in the Bank who does not hold a corresponding share in the Road. The Bank, however,

is to be managed by a separate Board of Directors, and neither the Stock nor the profits of the Bank are to be in any way liable for the construction or expenses of the Road—so that *the entire profits of the Bank must be divided amongst the Stockholders.* Under a resolution adopted by the directors, it is proposed to put the Railroad Bank in operation in November next. The resumption of specie payments by the State Banks, will render this comparatively easy. Books of subscription will be opened on the 2d Monday in October next, and continue open for one month, when every Stockholder in the Road, will be at liberty to subscribe for as many Shares in the Bank as he may think proper, not exceeding the number of Shares held in the Road. It is not doubted that the Stockholders will embrace the opportunity thus afforded of securing to themselves a valuable property, and at the same time of ensuring the success of our great work, which is inseparably connected with the establishment of the Bank. Even where the situation of the Stockholder might forbid his holding an amount of Stock in the Bank, equal to that for which he may have subscribed in the Road, a due regard to his own interests would require, that he should subscribe for the full amount to the Bank, and pay the first instalment of $12½. This will give an immediate value to his Railroad Shares, and he will be able to substitute others in his place on advantageous terms, and without injury to the Company—while a failure to subscribe to the Bank, would reduce the value of his Stock, and deprive him of the opportunity of availing himself of the benefits of the Bank at any future period. The Stockholders in the Bank will meet in person or by proxy, in Charleston, on the 20th of November, for the purpose of electing Directors, and it is proposed that the Bank shall go into operation as soon thereafter as possible, for which purpose the bills of the Bank of the various denominations are already in the hands of an engraver, and a temporary banking house will be provided. Branches will be established in Tennessee and North-Carolina, as soon as possible after the Mother Bank can be put in operation in Charleston.* We submit herewith the last semi-annual Report of the President and Directors of the Charleston and Hamburg Railroad Company, which affords satisfactory evidence of the great progress which has been made in the repair and improvement of that road, and of the steady increase of its business and income. It is known to the Stockholders, that this Road, of which we have now become the proprietors, was originally constructed on a frame work of wood, without any embankment, and that the Iron Rail consisted of a common flat bar, weighing 15lbs to the yard, and fastened on wooden string pieces, by iron spikes. This simple and cheap plan of construction was adopted from the necessity of the case, arising from the very limited resources of the Company. When the Charleston and Hamburg Railroad was undertaken, there was no example of a road of equal extent having been undertaken either in Europe or America, and the project had therefore to encounter a weight of prejudice and opposition against which it had long to struggle.

The perseverance and public spirit of its projectors carried it successfully through, and it stands now a monument of their wisdom and patriotism. As the business of the Road however, began to increase, it soon became apparent, that a road constructed so slightly, of such perishable materials, and with so thin and light a rail, could not possibly answer

* Since making this Report accounts have been received of Gen. Hamilton having effected the loan of $2,000,000. in London, at an interest of five per cent. and on a credit of twenty-six years. Of this sum half a million of dollars have been ordered to Charleston in *specie*, to enable us to put our Bank in operation under the most favorable circumstances.

the expectations of the public, nor to secure to the Company the vast advantages that might be expected from a more solid structure. Measures were accordingly adopted for the purpose, in effect, of re-constructing the Road, by throwing up an embankment along the whole line, and laying down a new and heavier iron rail. Great progress had been made in this important work, when it was determined that our Company should become the purchasers of the Road.' Since that purchase was effected, the work has been pushed with much vigor, and there is every prospect of our having the Road in complete order, in the early part of the ensuing year. When this shall be accomplished, there will be every reason to hope, that the expenses of the Road will be so greatly diminished, and its business so much increased, as to enable us to give to our stockholders a handsome dividend from this source, after providing for the interest of the debt contracted for the purchase and repair of the road. In the measures adopted and prosecuted for the improvement of this Road, the country is largely indebted to the late President, John Ravenel, and his successor T. Tupper, Esq.

Under the administration of these gentlemen, have been devised and executed these important measures, which promise to make the Charleston Railroad, one of the most useful and profitable in the Union. It will be seen from Mr. Tupper's Report, that experiments are now being made under his direction, for the purpose of testing the efficacy of a preparation of corrosive sublimate in giving greater durability to timber used in the construction of railroads. This process, called, "Kyanizing," (being invented by a gentleman of the name of Kyan, in England) has for some time past commanded the attention of scientific men, and the public authorities in Great Britain. Experiments, made under the orders of the Admiralty, have shown, that while one part of a stick of timber, saturated with the solution, has remained for several years, without any appearance even of incipient decay, another portion of the same stick became so completely rotten, as to be entirely unfit for use.

Several ships, as well as public buildings, have accordingly been constructed in England of Kyanized timber, and the problem will soon be solved, as to the benefits to be derived from it. Should the results be favorable, the timber of the South will become a *durable material* for the construction of railroads, an event, which cannot fail to have a most auspicious influence on our fortunes.

We would next call the special attention of the Stockholders to the annexed table taken from the report of Mr. Tupper, which exhibits a gratifying view of the increasing business on the Charleston Railroad, even in its present unfinished state.

Statement of the Income of the South-Carolina Canal and Railroad Company, and of the number of Bales of Cotton conveyed to Charleston upon the Road, from 30th October, 1830, to the 30th June, 1838.

	No. Pass.	Amount Pass.	Amount Freight.	Mails, Storage, &c	Total Receipts.	No. Bales.
Oct. 30. 1830, to Dec. 31, 1833.					44,070 73	
In 1834,	27,649	17,050 35	83,214 44	4,294 66	166,559 54	24,567
In 1835,	32,283	109.576 61	131,782 94	8,394 35	249 753 90	34,760
In 1836,	82,216	129,982 34	140,033 84	1,595 01	271,613 99	28,497
In 1837,	45,554	131,282 61	138,269 17	10,663 10	280,214 88	34.395
In 1st half y'r 1838.	26,808	80,642 77	78 096 69	6,641 91	164,231 37	17,975
In 1st half y'r 1837.	22,506	71,202 12	46,581 26	5,200 14	122,077 52	6,220

The able report of Major McNeill, the Chief Engineer, with the accompanying documents, will fully explain the operations of the Engineer department, during the past year, and the report of the Treasurer will exhibit the state of the finances.

It will be seen from the report of the chief Engineer, that we have succeeded in South Carolina in inducing the planters to enter into contracts for the graduation of the Road through their respective plantations—thus bringing into operation the Slave labor of the country for railroad purposes. The very strong objections urged against bringing white laborers from abroad, to mingle with our slaves on the large plantations—the necessary suspension of operations, where white laborers are employed during the sickly season (unless we were prepared to witness a destruction of life shocking to humanity) induced us at an early period to make great efforts to prevail upon the planters to take contracts. In the beginning this was found to be no easy task. By proper explanations, however, and making a small addition, in the first instance, to the estimates of the Engineer, the object was effected. The experiment has been so entirely successful, that when the second division of the road was offered for contract, the competition was so great, as to enable us to make contracts in every instance at or below our own estimates. Indeed, we may now say, that in the Slave holding States, we can command slave labor to any amount for the construction of our Railroads, and this too, at reasonable prices. In reference to this subject, Major M'Neill in his report, states.

"The daily useful effect of this labor, has been proved by our own experience, in the work now going on below Columbia—to be full as great, as that of the white laborers, on which elsewhere we mainly rely. Indeed, it has in more than one instance exceeded what has fallen under my observation elsewhere. A negro has excavated of light earth, 23 cubic yards in a day, thrown the same into a barrow, and carried it an average distance of 35 feet; and a whole gang has in like manner disposed of 18 cubic yards, while the labor of the white man at the North, on a similar soil, is estimated at 15 cubic yards, an amount which the negro is found to perform easily and cheerfully." We consider this result as very auspicious for our enterprize. While the planters in these portions of the country, where slave labor abounds, will thus find profitable employment for their slaves, they cannot fail to become deeply interested in the success of the work; their lands will be rested—emigration prevented—the money expended on the Road will be distributed among our own people, and the country every way benefitted and improved. When in the progress of the work, we shall approach those regions where white labor abounds, this will be called into requisition and the farmers and laboring men along the line, will find constant and profitable employment, as well as a ready market for all their productions. Thus will this work, even in its progress, serve to enrich and fertilize the country, through which it will pass—giving a foretaste of the more extended and substantial benefits, that must flow from its completion, and constantly swelling that tide of public opinion, on which we mainly depend for our success.

Referring to the Engineer's Reports for detailed information on all matters connected with the Engineer Department, we shall merely here advert to the very favorable character of the route between Branchville and Columbia, and the gratifying prospect presented, of our being able by a new Gap recently explored by Major M'Kee—near Wheeler's Gap—to find a better passage across the Cumberland mountains, than any here-

tofore discovered. "By Big Creek Gap, (says Mr. M'Kee,) it appeared very clear to me, that a grade of 60 feet to the mile could be carried over the mountains, without varying materially from its *natural surface*, and *without what is called a developement*" If on a further survey, this should prove to be the case, very little doubt can be entertained that a road may be constructed by this route at a grade probably not exceeding 50 feet. On a recent visit to the Baltimore and Susquehanna Rail Road, the President of this Company found the Locomotive Engines ascending with great ease, grades of 60 feet to the mile, and near the summit of the ridge, of 84 feet to the mile*—and he was informed by Major Trimble, the chief Engineer of the work, that one Engine of ordinary weight and construction had carried up to the top of the plane, a weight equal to 250 passengers, at a speed of 7 miles an hour. The Road from Branchville to Columbia, it will be seen is, in almost its whole distance of 66 miles, a series of straight lines, and in the few instances in which deviations have been admitted, the curve are on radii of from 2,800 to 5,700 feet, the line varying from a level, to 25 feet to the mile—and even this inconsiderable rise, is found but for a few miles on the entire route. Of the plan of construction proposed by the Chief Engineer, it is not necessary for us at this time to say more, than to express our entire concurrence in the general views he has presented in favor of a heavier Rail, and a more permanent structure than has usually been resorted to, in the Southern States. The Rail Roads heretofore constructed in this country have varied from a mere frame work of wood, and a flat rail of 15 lbs to the yard, to a solid stone structure, with the T. or H. Rail, weighing 60 lbs. to the yard, and costing from $5,000 to $50,000, the mile. In England, the solidity and expensive character of their works, have in some instances carried up the cost to upwards of $100,000 per mile. Now it is obvious, that if Rail Roads in this country could only be constructed at the enormous expense incurred in England they could not in the present condition of our country, be constructed at all; and we will add, if Rail Roads could only be made amongst us, at the cost of many of those which have been built in the Eastern States,—*we* should in like manner, be deprived of the benefits of such works. As Major M'Neill has well observed, the "British fashion," in these things is wholly inapplicable to this country.—and we will add, that the most expensive structures of the North, are equally inapplicable to the Southern States. There is, however, a wide range for choice between the most expensive Railways of the North, and the frail, and imperfect works that have been erected, in many instances at the South. The skill of the Engineer, and the judgment and experience of the Board, must be exerted in adopting the *proper medium*, having a due regard to economy on the one hand, and durability on the other. We have many advantages in this respect over the States further North—of which we should avail ourselves to the fullest extent. Pine timber admirably adapted to the construction of Railroads, is, in general, to be found in the greatest abundance in the track of our roads. We have a level surface and a sandy soil, and will not find it necessary to guard against the effects of the frost in winter, which makes *an addition of* $5,000 *a mile*, to the cost of Railroads at the North. We have a species of labor which can be commanded to almost any extent without any increase of expense on

* This work, we understand, was planned by Major M'Neill, our Chief Engineer, who resigned his situation as Chief Engineer on that Road, when he entered into the service of our Company. The work has been executed by Isaac Trimble, Esq. his successor.

account of the *increased* demand, and without the smallest liability to riot or civil commotion; and finally, when our roads are completed, and our steam engines are set in motion, we have an inexhaustible supply of fuel costing only a third or fourth as much as is paid at the North. These are advantages that cannot be too highly estimated. In prosecuting our surveys for the ensuing year, it is proposed to cause the Deep Creek Gap, pointed out by major M'Kee, across the Cumberland Mountains, to be carefully surveyed, and the facilities it may afford for the passage of that range ascertained. We shall also be prepared to prosecute such further surveys in Tennessee, North-Carolina, and Kentucky, as the Directors from these States shall deem expedient, and for which the necessary funds may be provided. It is proposed, that the sections of the Road between the Lexington and the Kentucky River, and between Knoxville and the North-Carolina line, shall be more minutely surveyed, with a view to the location of these portions of the Road at the proper time. With respect to that part of the Road extending from Columbia to the Butt Mountain Gap, several routes have already been surveyed, all of which have been found to afford great facilities for the construction of a Railway. A careful comparison of the relative advantages of these several routes, will require a more minute examination, which will be made prior to the final location of the Road, which will take place as soon as our Bank can be put in operation, and sufficient progress shall be made on the work, now going on below Columbia. We shall commence the construction of the work above Columbia, as soon as circumstances may permit, and in the mean time will take all proper measures to inform ourselves fully of the relative advantages of the different routes, so as to be able, finally, to select *that route*, which on a careful examination and impartial comparison with others, shall be found best adapted to our purpose. In concluding this Report, the Board cannot refrain from offering that heartfelt congratulation to the Stockholders, on the success which has thus far attended our efforts. As the noble work in which we are engaged, is the greatest enterprize of modern times, so it has been attended by difficulties almost unexampled. Of these we have already given a brief statement, and shown that they have been so far, happily overcome. The means now at our disposal, properly exerted, cannot fail to ensure success. The loan of $2,000,000 in Europe, the establishment of the Bank, the proper improvement of the Charleston and Hamburg Railroad, and a prompt compliance on the part of the Stockholders, with all such demands as the progress of the work may render necessary, aided by harmonious counsels, and vigorous measures, cannot fail to accomplish our great work. Let us never for one moment forget, that ours is not an enterprize founded exclusively on a calculation of pecuniary advantages to the Stockholders. Though the liberal provisions in our charter prove, that the Legislature have not been unmindful of the interests of the Company, yet there are higher and holier objects connected with this magnificent project. The great object IS TO BREAK DOWN THE MOUNTAIN BARRIERS which separate two entire sections of our common country—to bring the South and West together—and to bind them forever to each other in the bonds of A FREE SOCIAL AND COMMERCIAL INTERCOURSE, the only sure foundation of a PERPETUAL UNION. In the promotion of this grand and noble object, let the Directors and Stockholders pledge themselves to each other and to the world, never to intermit their efforts, until a Railroad communication shall be established between the South Atlantic, and the navigable waters of the West, and while we move steadily forward

in this noble work, let us resolve to consider nothing accomplished, while any thing remains to be done.

By order of the Directors,

ROBERT Y. HAYNE, President.

Ashville, N. C. Sept. 17th, 1838.

Extract from the Annual Report of the Council of the Institution of Civil Engineers.

The Council have to regret the loss to the Institution by death of its Member, Arthur Woolf. This distinguished individual was born at Camborne, in Cornwall. He was a millwright, and in that capacity went to London, and was employed in Meux's Brewery. In 1804, he took out a Patent for his Two Cylinder Engine, working high pressure steam in a small cylinder, and allowing it to expand in a large one. When he first commenced erecting engines in Cornwall, he induced the proprietors of the foundries to improve their machinery, that a better style of workmanship might be used in the manufacture of steam-engines; and he introduced an improved Hornblower's double beat valve. The work done at the Consolidated Mines, proves him to have been a person of great talents. In October, 1814, the average duty of the engines in Cornwall was 20½ millions; Woolf's engine at Wheal Abraham, however, performed 34 millions; and in December 1815, 52 millions; and in May, 1816, 57 millions; while the average duty of all the engines reported in Cornwall was 23 millions. In 1820, Mr. Woolf erected engines at the Consolidated Mines having cylinders of 90 inches in diameter, and a stroke of 10 feet —the most powerful that had ever been constructed. In December, 1827, a trial took place with one of Woolf's 90-inch engines, and it performed a duty of 63½ millions—the average duty of 47 engines reported in this year was 32 millions. For some years before his death he received a pension of 100*l.* a year from the proprietors of the Consolidated Mines. His name is associated with the improvements in the drainage of the Cornish Mines; and whatever share posterity may assign to his individual genius in these improvements, his name is recorded in the page of history among those who have dedicated their talents and the opportunities of a long life to the advancement of practical science.

Abstract of Papers read at the Institution of Civil Engineers, January 9th, 1838; W. Cubitt, Esq., V. P., in the Chair.

"On the Duty of Cornish Engines, by Thomas Wickstead."

Mr. Wickstead having obtained permission to make a trial of an engine upon Holmbush mines, near Callington, proceeded to ascertain, with grest accuracy, the dimensions of the engines and the pumps, and the duty performed.

The diameter of the cylinder was 50 inches, and the whole height of the lifts 535 feet 6 inches, and the diameter of the tie and rose lift pumps were 11 inches, and the bottom lift 10 inches.

He had 94lbs. (a Cornish bushel) of coals weighed, and took every precaution to ascertain exactly the work done by this quantity. Previous to the trial, the length of the pump-stroke, viz. 5 feet 1 inch, was mea-

sured, and the quantity of water delivered per stroke was found to be equal to 285·6lbs. The steam was cut off at one-sixth of the stroke, and the temperature of the cylinder in the jacket fully kept up by a free communication with the steam in the boiler. In making the trial, the fire under the boiler was worked down as low as could be without stopping the engine—the pressure of the steam being 40lbs on the square inch in the boiler. Taking the counter, and the time the engine was started, at the end of 2¼ hours the fire was lowering and the speed of the engine reducing, and it was necessary to have more fuel; the 94lbs. of coal having been consumed, the engine was then stopped, and the counter again taken; it had made 672 strokes, or nearly 5 strokes per minute; the weight of the water raised was 1,918,282lbs., so that the product of the weight and the height through which it was raised, expressing the performance of the engine, was 102,721,323lbs. of water raised one foot high with 74lbs. of coal.

This result, however, although it shows the quantity of water raised, does not show the duty of the engine, as no allowance has been made for the unavoidable leakage of the pumps; the fairer method, therefore, of calculating the duty of the engine is from the product of the areas of the pumps, the length of the stroke, and the pressure due to the column of water equal to the height of the lifter; and the duty of the engine in question, calculated upon the above principle, is equal to 117,706,992lbs. lifted one foot high with 94lbs. of coal. The author observes, that the engine had not been overhauled, or anything done to it, to prepare for the trial, the particular engine upon which the trial was to be made not having been determined upon until the previous day; also, that the boiler and flues had not been cleaned for eleven months. The object being to prove what could be done by an engine worked upon the expansive principle. Mr. Wickstead considered that a trial for two hours would prove the capability of the engine, although most probably the average duty of the engine for twelve months would not be so great as it was for the short time that it was under trial.

Having calculated the effect which could have been produced by the steam-power, provided the engine and pump gear had worked without friction, the difference of the result obtained, and the *duty* of the engine, shows the amount due to the friction, which in the present case was equal to 93,751,710lbs. raised one foot high, or about 7·75lbs. pressure per square inch.

It having been observed that the expansive principle would not answer for rotary or double engines, Mr. Wickstead was induced to make some observations upon a double engine, working the stamps for breaking the copper ores at the Turcroft mines. The steam was cut off in the down stroke at two-fifths, and in the up-stroke at one-third, the engine working with a very equal velocity, and upon an average consumption of coal of 30 bushels for the twenty-four hours. The engine was working a set of stamps—a pump—a crushing machine—and a tumking machine; and the result of the calculation was, that the duty done by the engine was 56,525,072lbs. lifted one foot high, with a bushel, or 93lbs. of coal.

Mr. Wickstead has given two tables; the first is a table, chronologically arranged, exhibiting the gradual improvements of the steam-engine in the course of 66 years; the second, the average duty performed by the engines in Cornwall in 1835 and 1836; and, on the authority of Mr. John Taylor, a comparison of the depths of the Cornish mines at different periods, the water raised and the coals consumed, showing a saving upon

the books of the mines proportionate to the improvements in the working of the engines, stated to have been made during those periods.

The average weight of the coal used in Cornwall is 93lbs. per bushel, and that the 94lbs. above mentioned was the Cornish bushel by weight and not by measure. The coals used in Cornwall are nearly all imported from South Wales, and chiefly from the ports of Swansea, Neath, and Llanelly, but are generally of second-rate quality, the better sort being selected for other purposes.

The advantage gained by having steam of a high temperature in the steam jackets of expansive engines is very great. The best engines in Cornwall have the steam jackets supplied from a pipe communicating directly with the boiler. About eight years since, the jacket of an 80 inch steam cylinder at Wheal Towan mine became leaky at the joints, and they were obliged to shut off the steam from the cylinder jacket for a month; that immediately upon so doing they were obliged to pack the piston afresh, as it would not work, which was attributed to the contraction of the cylinder, in consequence of their being less heat, there being no steam in the jacket; that the duty done by the engine this month was but 55 millions, whereas, when the steam was admitted into the jacket, both before and after this period, the duty done was 70 millions.

"On Captain Huddart's Improvements in Rope Machinery: by W. Cotton, Esq."

Captain Huddart's attention was directed to the subject of rope-making, in consequence of observing every morning during a voyage that some of the external yarns of the cable were broken, even when it had undergone no very heavy strain.

The cause of the failure of the yarns soon became apparent, in that the strands being all of the same length, an additional strain was of necessity thrown on the external yarns by the process of twisting, when the internal yarns were kinched up.

This defect he proposed to obviate, by giving to each yarn an increased length in proportion to its distance from the centre of the strand, and the angle at which it was laid; for this purpose he invented a machine which he termed a register, which so regulated the length of the yarns as to make them, when twisted into a rope, all bear their due proportion of the strain.

The entirely satisfactory results attending Captain Huddart's experiments rendered him anxious to see his plan of rope-making tried on an extensive scale, and ultimately the partnership of Huddart and Co. was formed, and works at Limehouse were commenced and completed under his superintendence.

For many years the machinery was only employed in the construction of the strand, by which the great increase of strength was obtained, the rope being completed by hand in the usual manner by four gangs of men, three gangs giving what is termed the hard to the strands and keeping up the twist, as the other gang twisted them the other way into a rope; the correctness of this operation depending on all these gangs working with proportionate power and activity, it was frequently found that the strands were not laid in the rope with such accuracy as to allow each of them to bear its proper proportion of strain; and in order to render his plan of rope-making more complete, he designed the large laying machine, which effectually prevented the defects which it was difficult to avoid under the old system.

January 30, 1838. The President in the Chair.

"On the relative advantages and disadvantages of Four and Six Wheels for Locomotives; by Edmund Woods."

The engines at first introduced upon the Liverpool and Manchester Railway were found to be much too slightly constructed for sustaining the shocks and the strains to which their high velocities and the inequalities of the road continually exposed them; so that, after a short period, each individual engine required and underwent a thorough and general repair. These repairs consisted in the substitution of greater strengths and more approved forms of material, together with a mode of connexion of the parts better adapted to resist the repeated and periodical concussions. Thus the outer and inner framings were stayed—wooden wheels replaced with iron ones—crank axles constructed with nearly double the original quantity of materials—pistons, piston-rods, connecting rods, and brasses, were proportionably enlarged, until little remains of the old engine but its boilers and cylinders. The weight of the engine was increased, in consequence of these alterations, from about four and a half tons to nearly ten tons. The effect of this increased weight upon the road could not be otherwise than highly prejudicial, and the result was, that the road originally formed of rails intended to support a moving mass, not exceeding four and a half tons, distributed upon four wheels, was constantly out of repair, the rails being seriously bent, becoming loose, and frequently broken; so that it was found absolutely necessary to relay the whole line with stronger rails, and, as a temporary expedient, to substitute props under the rails between the points of support, and to add a third pair of wheels to the back part of the framing of the engine, behind the fire-box. The advantages obtained from the alterations, and the additional pair of wheels, were almost immediately apparent. The engine lost in a great degree its peculiar rocking motion, as also the unsteadiness arising from lateral undulations. Besides such direct and immediate results, time soon developed further consequences of an important nature, the component parts of the engine remaining for a much longer period securely united and firm, the fastenings of the tubes ceased to leak and give way, and the framings retained more permanently their fixtures, besides the increased safety in the diminished liability of the engine to run off the rails in the event of any accident. The author then considers the often-agitated question of an outside framing to the engines, and proceeds to the consideration of the principal objections against the use of six-wheeled engines, which objections are—1st, The less adhesion to the rails than four-wheeled engines; 2dly, That the axle and weight of the wheels adds to the resistance, and consequently detracts from the available power; and 3dly, That they cannot traverse curves without increased strain and friction. With regard to the first, it is true that the adhesion is less, adhesion being proportioned to the pressure; but the real question to be considered is, whether the ratio between the adhesion and the power of the engine is not sufficient for all practical purposes; and from the working of the Liverpool and Manchester line, it appears that such is the case. To the second objection, Mr. Woods does not attach much importance, as the additional weight of a pair of wheels, axle, springs, &c., does not exceed 12 cwt., and, therefore, on a liberal estimate, cannot diminish the tractive power of the engine by 1-200th of the whole.

With respect to the third objection, the tendency to strain and friction in passing round curves, and the difficulty of taking the points, is entirely

obviated by a very simple expedient. The plummer blocks of the hind wheels are made very light and elastic, so that they will yield readily sideways to an impression. For this purpose, it is found better to use small wheels, say three feet in diameter, that the plates may be long, and the axles at a considerable distance from the framing. Such methods render six-wheeled engines capable of travelling safely curves of eight chains radius, at a speed of six to eight miles per hour; and an instance has occurred of a small curve of even four chains radius being passed at a slow speed.

"On Improvements in Water Wheels; by Isaac Dodds."

The result of many experiments, with a view of lessening the bad effects produced by the back water upon the water-wheels on any sudden rise or flooding of the stream, had led Mr. Dodds to recommend the adoption of two air-vessels, which may press the sides or water-guides, and serve to carry the wheel; those, when properly ballasted, may raise or lower the wheel and the machinery, according as the water is higher or lower, the race being so adapted that the dam-head may be raised in the same proportion as the back-water.

February 13.

"A Description of the French Method of Constructing Flat Roofs with Earthenware Pots; by F. W. Simms.

Mr. Simms having a short time since visited Paris, with a view to examine into the nature and various applications of the asphaltic mastic of Seysel, there extensively employed in the construction of foot-pavements, the covering of roofs, and other purposes, was led, in the course of his inquiries to examine the construction of the roof of the Manutention des Vivres de la Guerre, Quai de Billy, which is formed of earthenware pots and coated with asphaltic mastic. The roof, which forms a terrace, is nearly flat, having just sufficient inclination to carry off the rain; the voussoirs of the flat arches are formed of the cylindrical earthenware pots,* nearly resembling our chimney-pots, with the exception that both ends are closed, and one end being finished off nearly square. The dimensions of the pots vary with the size of the roof to be constructed; those used in the abovenamed roof are about nine inches long, and five inches in diameter. The thrust of the arches is resisted by iron bands, and the external walls firmly tied together, and between them and the longitudinal middle wall the arches of the roof are turned with these pots set in mortar. The soffit of the arches being covered with plaster, forms without the intervention of timber, the ceilings of the upper apartments. The extrados of the arches is covered with beton, which is spread so as to give the required inclination for carrying off the water; this surface is afterwards carefully smoothed over with a thin coating of hydraulic mortar, which when dry is itself covered with canvass stretched tight; upon the canvass is poured the asphaltic mastic in a semifluid state, which setting in a few minutes, forms the finished surface of the terraced roof. Mr. Simms details some facts showing the surprising strength of the roofs thus constructed, and their easy reparation when injured.

* This method of forming arches has been adopted in England for many years; several roofs at the Bank are thus constructed.

February 20.

"Dercription of Clegg's Dry Gas-Meter."

The meter invented by Mr. Clegg for measuring gas may be applied to other useful purposes, as the registering the average pressure of high-pressure steam every hour, day, or all the year—the average temperature of heated air, as it leaves the boilers of steam-engines---or registering any variable temperature for any period.

The principle of action of the dry gas-meter is the evaporation of spirits of wine, which is well known to vary *directly* as the heat.

To contain the spirits of wine, and to cause a perpetual action as long as the heat is applied, there are two glass globes, about 1 and ¾ inches diameter, ½ an inch apart, joined together by a glass tube of about ¼ inch bore; these globes are balanced upon an axis, about which they can freely revolve; one globe is nearly filled with spirits of wine, and in the other a perfect vacuum; these globes are suspended in a frame upon an axis, the gas from the main is then introduced by means of a pipe conducting it to the underside of a gas-burner placed over the globes, which is always lighted when the meter is in action, the gas in its passage is thereby heated, and then conducted by a continuation of the same pipe, terminating by two orifices of nearly equal area, the lower one being rather the largest. These orifices are opposite the centre of each globe; it is obvious, therefore, that the excess of heat would be on the lower globe, and, as the temperature of the burner above the meter varies, so would the excess of heat on the lower globe, and in this state would be useless, as the correctness of the meter depends upon an uniform temperature between the globes, whatever be the temperature of the source from whence it is derived. This uniformity of temperature is accomplished by another portion of gas, much colder than that portion which comes in contact with the burner, but still heated from the same source, blowing upon the upper bulb, this orifice exceeding the difference of area of the two orifices before mentioned, as the temperature of the gas in the lower orifice exceeds the temperature of the colder portion of the gas which is discharged upon the upper globe, so that, if the gas discharged upon the lower globe receives more heat from the burner, the portion of colder gas receives the same quantity of caloric, and counteracts the effect which would otherwise be produced.

It is then ascertained by actual measure what quantity of heated gas will cause the spirits from the lower globe to be driven into the upper one, and this once ascertained, is as much to be depended upon as the vibration of a pendulum.

The globes are so adjusted upon their axis that they remain at rest when one globe is over the other, but so far out of the centre of gravity, that when the spirits from the lower globe is discharged into the upper one, it will by its weight descend, thus causing a vibrating motion, these vibrations being registered by a train of wheel-work as in the water-meters.

"On the Application of Steam."

The minutes of the discussion on Mr. Wicksteed's paper and the Cornish engines having been read, Mr. Parkes called the attention of the Institution to the importance of the question of the applicability or inapplicability of the Cornish system of using steam to condensing engines generally. It seemed to him, after the confirmation of the statements

regarding the Cornish engines had lately received from the praiseworthy exertions of Mr. Wicksteed, that, as regards economy of fuel, the Cornish engine was even still more superior to the low-pressure engine, than the latter was (at the period of its invention by Mr. Watt) to the original atmospheric one; that there existed, indeed (if all we heard were true), less economical difference between Mr. Watt's and the high-pressure or non-condensing engine, than between the Cornish and the common Boulton and Watt engine. If such were the case, which could now scarcely admit of a doubt, Mr. Parkes thought, that the interests of science and the arts demanded a much more thorough and searching investigation into the rationale of the Cornish engine than had yet been made; and he thought it a reproach to the Institution, that no one of its members is yet prepared to say, whence arises the superiority of the Cornish engine, nor what is the relative value of the various perfections which had been for so many years assigned to it by its employers.

Mr. Parkes thought that most engineers were agreed, that the low-pressure crank-engine, used for manufacturing purposes, required, in its highest state of condition, at least ten pounds of good coal per horse per hour; that such was Mr. Watt's own estimate, allowing one pound of coal for the evaporation of seven pounds of water. He had had many opportunities of proving—so far as the Indicator can be relied upon—the load and consumption of Boulton and Watt's own engines, as well as engines by other makers; but only in three instances had he found the consumption so small as ten pounds. He had only in one instance been concerned in ascertaining the duty done by a pumping engine---which was one of the same kind---not working expansively; and as this experiment was conducted with the most rigorous exactitude, the correctness of the results might be relied upon. The engine was nominally one of forty horses' power, constructed by Messrs. Hick and Rothwell, of Bolton, erected at St. Ouen, near Paris, and employed to raise water, by means of a scope-wheel, to supply a new dock. The experiments of two consecutive days were managed and checked by M. Arago, M. Jouy, Mr. H. Farey, and Mr. Parkes. By the Indicator the engine proved to be working exactly to forty horses' power, with a consumption of eleven pounds of good Mons coal per horse per hour; but as the actual weight of water raised, one foot high per minute, divided by forty horses, attained 36,000 pounds, the real consumption was about ten pounds of coal per horse per hour. Mr. Parkes adduced this experiment, with an engine of the most perfect construction and in perfect condition, as evidence, that the duty of the common low-pressure crank-engine, not working expansively, does not exceed twenty or twenty-one millions of pounds raised one foot high by ninety or ninety-four pounds of coal; and thus that the Cornish engine, investigated by Mr. Wicksteed, exceeds such engine, in economy of fuel, in the ratio of five to one.

Mr. Parkes then entered at some length into a consideration of the various phenomena to be observed, and facts to be ascertained, in order to determine the separate value of the parts of the system adopted in Cornwall. The assertion that the boiler was superior to others, would be confirmed or disproved by measuring the water evaporated by the fuel used---which might also be done with such accuracy, as to furnish us with the very important knowledge of the quantity of water in the shape of steam required for each stroke of the piston. A thermometric steam gauge should be fixed on the boiler, and another as near as possible to the cylinder, to determine both the pressure within the boiler, and at what

pressure the steam really enters the cylinder. He suggested also that another such thermometer, fixed on the cylinder cover, might be useful, in conjunction with the Indicator, to determine the increments of expansion, as well as the highest and lowest degree of pressure within the cylinder. That it appeared to him that the Cornish engineers had carried out to perfection Mr. Watt's axiom, that "the cylinder should be maintained as hot, and the condenser as cold, as possible," and that since the hot jacket probably played a still more important part to the cylinder of an expansive than to a non-expansive engine, no means should be left untried to ascertain the value of that element. That the thermometric steam gauge might also be an useful adjunct to the barometer, in determining the amount of vacuum in the condenser, and other phenomena connected therewith. The proportions of the air-pump and condenser to the cylinder, adopted by the Cornish engineer, should also be noted, as well as the temperature of the injected and ejected water.

"On the expansive Action of Steam in Cornish Engines. By W. J. Henwood."

At the commencement of this paper, the author describes, with great detail, the action of the Indicator, and the nature of the evidence which it furnishes on the working of an engine. The author then states the results arrived at on applying the Indicator to the cylinders of some of the best engines in Cornwall. The peculiar circumstances of each case, as the clothing of the boilers, steam pipes, and the various methods adopted for keeping up the temperature of the cylinder, are detailed. The steam cases or jackets of some of the engines were filled with dense steam from the boilers of others with heated air. The dimensions of the working parts and the loads of the engines; the water and steam in the boilers; the temperatures of the hot well of the condensing water, of the boiler shed, engine-house, and external air; the duration of the experiments; the coals consumed, according to weight and measure; the quantity of oil and grease; the number of strokes; the duration of each experiment; and the pressures of the boiler and cylinder, are tabulated for the respective engines.

The greatest duty recorded as performed respectively by the measured bushel, by 84 pounds damp, and by 84 pounds dry, is 86½, 72½, and 77½ millions.

"Particulars of the Construction of the Floating Bridge, lately established across the Hamoaze, between Torpoint, in the County of Cornwall, and Devonport, in Devonshire; by Jas. M. Rendel, Member.

The width of the river Hamoaze, at the site of the bridge, is, at high-water, 2,550 feet, and low-water, 2,110 feet The greatest depth at high-water is 96 feet, and low-water, 18 feet. The strength of the current at ordinary spring-tides, is from 260 feet per minute, or nearly three knots an hour, to 330 feet per minute, or three knots three-fourths an hour, varying in different parts of the passage; but heavy land-floods, accompanied by a north-west wind, make the ebb-tides run with a velocity of nearly five knots an hour.

The site lies directly at right angles to the line of current, a disadvantage that could not be avoided, as the mooring of the ships of war prevented the selection of an oblique line of direction, and the situation is so exposed,

that ships lying in ordinary, in the immediate vicinity of the bridge, sometimes drag their moorings.

The bridge is a large flat-bottomed vessel, of width nearly equal to its length, divided in the direction of its length into three divisions, the middle one being appropriated to the machinery, and each of the side ones to carriages and traffic of all kinds. These side divisions or decks are raised from two feet to two feet six inches above the line of floatation; and by means of strong and commodious drawbridges or flat forms hung at each end of each deck, carriages drive on and off the deck from the landing places without much difficulty, or occasion for the least disturbance of horses or passengers.

The bridge is guided by two chains, which, passing through it over two cast-iron wheels, are laid across the river, and fastened to the opposite stones. Two small steam-engines are employed as the moving power, by turning a shaft, on each end of which there is a large cast-iron wheel, whereon the guide chains rest. The landing places on each shore are simple inclined planes, from low-water mark to two feet above high-water mark, formed to a slope or inclination of one inch twelve or one inch fourteen; and as the bridge approaches, the drawbridge is lowered on the plane.

To prevent the chains being so tight as to interrupt the free navigation of the estuary, or to endanger their breaking, instead of being fastened or moored to the shores, their ends have heavy weights attached to them, in shafts twenty feet deep and sixteen feet square at the head of each landing-place, the weights being cast-iron boxes loaded with five tons each, attached to the ends of the chains, which enter the shafts over cast-iron sheaves of two feet diameter. These weights rise and fall as the strain upon the chain becomes more or less, and prevents the tension ever exceeding the balance weights, which are considerably below the weight to which the chains have been proved.

The length of the bridge, exclusive of the drawbridges, is sixty-five feet; the width at midships, forty-five feet; and at the ends, thirty-eight feet six inches. The draught of water, when the bridge is full of heavy carriages, is rather under two-feet six inches, the clear depth of hold being four feet three inches.

The seat of the bridge in the water, or rather the lines of floatation, are elliptic, and the sides are curved vertically, the object of these forms being to relieve the bridge as much as possible from the effect of the current, and to prevent the sudden stoppage of a wave, and the consequent spray over the side.

The roadways or decks have cross battens to prevent the horses' feet from sliding, and also for the better holding of a thin coat of sand and tar, as a more agreeable footing than wood. The fencing of the sides of the roadway is complete, by carrying the timbers three feet six inches to four feet above the decks, and above that by the chains which suspend the drawbridges forming a rail.

The drawbridges are of the same width as the roadways, and are suspended by two three-quarter inch chains; one of which as before stated, forms a guard-rail to the side of the bridge; the other passes through the engine-house, being there connected with a small purchase machine.

There are two steam-engines, each having a cylinder of nineteen inches diameter, and two feet six inches stroke. They are common condensing beam engines, working at a pressure of three and a half pounds per inch in the boiler, and at an average speed of thirty-five strokes per minute,

and but one boiler. The feeding water is procured from a tank on the eastern landing place, and the waste steam being thrown into this tank, is sufficient to raise the water to 100°.

The guide chains are the common cable pattern, each one inch iron, and each link made to a gauge, so as to fit the chain wheels without slipping. When the bridge is on either side of the river, and the chains lie on its bed, and when the bridge is in the act of crossing, they necessarily form two arcs. The weights in the shafts rise and fall from five to eight feet, according as the weather and the tide may happen.

The time of the bridge crossing is seven minutes at low-water, and eight minutes at high-water.

From the London Civil Engineer and Architect's Journal.

Cast Iron Bearers.—Extracts from a Paper on the Relative Strength of several Cast Iron Bearers, when subjected to a Transverse Strain. By Charles Parker, Esq., *Fellow, read before the Royal Institution of British Architects, Jan.* 15, 1837.

The object of the paper was to give the results of a series of thirty-four experiments made by Mr. Parker, in an attempt to compare with one another the relative strengths of several forms of cast-iron beams when subjected to a transverse strain; also, to ascertain the difference in the strength of their sections when close, and when open or pierced, and to give some memoranda of girders that have been executed.

The following comprise the description of beams experimented on by Mr. Parker to obtain the requisite data:

Complete and open rectangular section—Complete rectangular section with webs in the middle—Complete and open rectangular section with web on upper edge—Complete and open rectangular section with web on lower edge—Complete and open rectangular section with web on both edges Complete and open rectangular section with spaces between the webs filled in solid.

The experiments were made on models of sufficiently large scale to allow of that precision in adjustment which is essential to obtain an accurate result. The length of each model when cast was two feet five inches and a half, and the depth was one inch and a quarter.

The principles on which the proportions of the sections were formed was to make the width of the complete rectangular beam the basis of every transverse section; consequently this same width is preserved throughout the whole of the several models in the narrow parts of the section, the webs being added in the proper places to make the required diversity of form. The depth and the length of the beam between the bearings in each of the examples were the same. The beams were supported horizontally at both ends, and strained by a force acting perpendicular at the middle point between the props. The quantity of deflection was multiplied by means of a lever index, and the pressure was continued three minutes before any addition was made to the weight. Four experiments were generally repeated of each section, and the strain was increased by fourteen pounds at a time, till the beam was fractured. The proportion of the iron used in the castings, were equal portions of hot blast calder iron and plate iron, taken from a cold blast cupola.

The following are the results of the experiments on the complete transverse sections:—*

		Wt. of Beam.	Breaking Wt.
		Ounces.	Pounds.
Complete Rectangular	A	28	375
Ditto with web in the middle.....	B	34	325
Ditto ditto on upper edge....	C	34	325
Ditto ditto on lower edge.....	D	34	550
Ditto ditto on both sides.....	E	42	750
Ditto with space between webs on both edges filled in solid.....	F	90	950

It is not intended to illustrate the principle of comparison by any numerical operations, or to form constant multipliers applicable to the strength of each separate section. This remains to be done by future experimentalists, as it is considered that the results which have been obtained are insufficient for that object.

From a cursory inspection of the tables, the following deductions are obvious:—That the strength of a beam to resist a given pressure is not in proportion to the quantity of materials it contains; and, that the power of each section to resist the straining force is obtained more by the proper disposition of the component parts than by the contents of the sectional area.

On comparing the several results, it will be perceived that the strongest form is obtained by the relation that subsists among the parts that make the section E, in which the neutral plane is disregarded, and the surfaces of extension and compression are proportionably increased.

Also in the sections B, C, and D, in which the three planes of the area of a beam are severally enlarged, it appears that the increase of material can be applied with advantage only in the lower surfaces subjected to extension; for, when added in the neutral plane, or on the upper and compressed surfaces, it essentially weakens the beam, and renders its powers of resistance inferior to the plain rectangular section A.

The truth of this conclusion is equally deducible from the proportional increase of the deflections with the earlier weights, in those sections where the lower surfaces are not enlarged. It was perceptible also by the shape and appearance of the parts presented where fractured. The whole of the results thus obtained seemed to indicate, that the resistance of the particles to extension is not the same, or equal to the resistance to compression; and on this principle it is suggested that the strongest and most economical section would be obtained by making the upper about half the projection of the lower web.

* By dividing the breaking weight in pounds by the weight of the beam in pounds, we obtain the following data as the proportional strength of each beam:—

		Wt. of Beam in Pounds.	Breaking Wt. in Pounds.	Proportional Strength
Complete Rectangular . .	A	1·750	375	214
Ditto with webs in the middle	B	2·125	325	153
Ditto ditto on the upper edge	C	2·125	325	153
Ditto ditto on the lower edge	D	2·125	550	279
Ditto ditto on both edges	E	2·688	750	289
Ditto with space between the top and bottom webs on both sides filled in solid . .	F	5·625	950	172

—Editor.

It is also observable, that the sections A, and F, although both rectangular sections, and the latter in the model made three times the breadth of the former, do not preserve the same relative powers of resistance, the section F, with $3\frac{1}{4}$ times the material supporting only $2\frac{1}{4}$ times the pressure; this result makes caution requisite in the use of the tables of the strength of beams that usually accompany works on this subject, wherein it is argued, that as a beam of an inch in breadth will bear a certain weight, so a piece five times in breadth will be five times as much, and the same as any other breadth, forgetting that in a beam of a certain quantity of material, the maximum of strength is obtained by a certain ratio of the depth to the breadth.

The whole of the preceding experiments were made with the middle portion of the section entire; but with a view of ascertaining whether the strength of the material would be essentially impaired by removing that portion of it which lies immediately contiguous to the neutral plane, or between the compressed and extended surfaces, several castings were experimented on. Still, before detailing these results, it appears desirable to give the particulars of two experiments that were made on hollow girders of an elliptical section.

1st Experiment.—Two girders 21 feet 2 inches long each; weight of No. 1, 13 cwt. 1 qr.; ditto of No. 2, 14 cwt. 14 lbs.; distance between the supports, 19 feet 8 inches; space between the two girders, 3 feet; loaded with pig-iron and equally distributed over the whole length; both castings being defective, they broke with the weight of fourteen and a half tons. The deflection in the centre was three-quarters of an inch under the pressure of ten tons. The fracture in both was two feet from the centre.

2d Experiment.—Two girders from the same pattern as above, being sound good castings; the same distance between the supports, and the same space between the girders; the load equally distributed as in the 1st experiment. Weight of 2 girders, 1 ton 8 cwt. 2 qrs.; ditto of each girder, 14 cwt. 1 qr.; both broke under the weight of twenty-one tons exactly in the centre of each girder. The deflection in the centre of the last two, during the process of weighing, was 5 tons $\frac{1}{2}$ an inch, 10 tons 1 inch, 15 tons $1\frac{3}{8}$ of an inch, 20 tons $1\frac{5}{8}$ of an inch.

It is scarcely necessary to mention, that the principle of strength in this section is taken from nature, where it is beautifully exemplified in the bones of many animals, in the structure of birds, and in the stems of most plants; but the advantages the form offers are defeated by the difficulty of obtaining sound castings, where the length exceeds the distance given in the experiments, namely, twenty feet.

Mr. Parker states, that, by taking away the parts about the axis, or hollowing the mass, slightly impairs its power to resist a transverse strain, while it produces a form of section that combines the least quantity of material with the greatest strength.

These two experiments therefore show, that, in the direction of the length, a portion of the neutral plane may be cut away without much injury to the strength of the beam, but as there is often a portion of the neutral plane removed in the direction of the breadth, the result of the experiments before adverted to remain to be mentioned.

Mr. Parker then proceeds to make some remarks on *open or pierced beams*. It has been generally considered, that in pierced beams, the disposition of the middle surfaces of the depth may be regulated by fancy; and that, provided sufficient diagonal and cross-ties are allowed

to connect the upper and lower portions, and prevent irregular contraction in the metal, no strength can arise from the distribution of these parts. Leaving this question for future inquiry, it is necessary to mention, that the plan of opening the beams, which was followed throughout the whole of the models, was similar to that recommended by Tredgold. Thus, the rectangular section had five-eighths of the entire depth taken away, and the several remaining portions disposed so as to keep an equal bulk in every part. The apertures had both ends circular, and both sides parallel, with the outer edges, thus connecting and giving stability to the whole beam.

The object now sought, was whether beams, having a portion of the middle cast open, were as strong and stiff as when cast solid, and after many trials the following were the conclusions.*

That beams of equal depth and breadth when cast solid are stronger and stiffer than when cast open.

The equal weights produce equal proportional deflections in the same section, whether cast open or solid.

That the strength and stiffness of the solid to the open section is in exact proportion to the quantity of material used in each section, and which, in the present case, may be numerically expressed as one third in favor of the solid.

Such are the results of the experimental researches made on this part of the subject, for which, from our prior view, we were little prepared. How far these effects might be modified by a different manner of opening the neutral plane, is matter of conjecture, and can only be determined by experiment. Indeed, from the constant assertions that had been previously made, we were imbued with the idea, that when a certain quantity of metal is cast into the form of a beam of a given depth, it was both stronger and stiffer if *pierced* than it would be if left *solid*. The results have proved this to be erroneous; and should it now be advanced on the ground that the equal quantity of metal, and not the equal depth of the two sections, are to be regarded, still, if found correct, it will not alter the general consequence that may be inferred from the experiments, namely, that into whatever forms the middle portion of the beams may be moulded, the advantage will be comparative, and there will be no deviation from the principle that has been found to operate in the hollow girders.

Opening of the Newcastle and Carlisle Railway.—On Monday the opening of this railway took place with considerable ceremony and festivity. The distance of the line from Newcastle to the Castle Basin, at Carlisle, is 61 miles. "The anniversary of the battle of Waterloo, which crowned the British arms with success, and restored peace to Europe," says the Tyne Mercury, "was selected as the day on which to celebrate the event, and one of the engines is named the Wellington. Different portions of the railway have been opened from time to time, and made available to the commerce of the North; but on Monday the whole line was passed over for the first time. The engines started in the following order: First, the Rapid, as an advanced guard, and without any train, displaying the union jack, which has long 'braved the battle and

* We regret that Mr. Parker did not give the particulars of these experiments, as they are most important.—Edit.

the breeze;' next, the Meteor, with four carriages and a flag, on which was inscribed, 'England expects every man to do his duty.' In this train we observed the Mayor of Newcastle and his friends, and the Allenheads band; then followed the Victoria with nine carriages, the Wellington with nine, the Nelson with seven, the Lightning with ten and the Carlisle band; next, the Tyne with its steam organ and nine carriages; after these came the Carlisle with eight, the Eden with ten, the Goliah with nineteen and about 600 passengers; then the Atlas with seventeen, next the Sampson with eleven; in this train there were very few passengers, but it was succeeded by the Newcastle with nine carriages well filled, and a flag hoisted, 'Prosperity to Newcastle,' followed by the Hercules, the last of the list, with eight carriages. The aggregate number of passengers in all the trains, upon a fair computation, exceeded 3,500, and the procession, previous to starting, reached nearly half a mile, but when in motion, could not be less than one mile and a half, allowing as much space between each train as was consistent with safety.—*London Paper.*

Railroad between Charleston and Georgetown.—We brought recently to the notice of the public a scheme for the connection of Charleston with Georgetown (S. C.) by a Railroad, as part of the line of communication, through Wilmington (N. C.) between the North and South. On conversing with a number of individuals of property and influence, in the district of country through which such a road would pass, and who fully appreciate the benefits of this project, we are satisfied that the cost, including bridges over both the Santees, would not exceed our estimate of $500,000. That an investment by capitalists in such an undertaking would produce as large a return as on almost any railroad in the Union, we feel satisfied, from the great amount of travel that must take place on it. A number of individuals of large means are ready to subscribe to such an enterprise, if an impulse were only given to it. The increasing abundance of money, and the difficulty that must shortly take place of finding advantageous employment for it, render this the acceptable period for the commencement of the undertaking. We should be prepared now to engage in the work, so as to mature it as nearly as possible after the completion of the Wilmington and Raleigh Railroad. We understand that this road will be ready for travellers, on its whole extent, by the 1st of June next, and that the proprietors expect to complete, by the 1st of December next, 110 miles, when it is understood that the great mail between the North and the South will be transported on it.

Important to Railroad Corporations.—In an action brought against the Baltimore Railroad Corporation for the loss of a cow killed by the cars, in the Baltimore County Court, the Magistrate in summing up, took occasion to say, that no proof of negligence had appeared upon the part of the engineer; that on the contrary, from the circumstances, it was evide t that the engineer, in behalf of his own life and the safety of the train committed to his charge had every inducement to prevent such an accident as had occurred; that unless negligence could be shown, no recovery could be had in a case of the kind. The judgment of the magistrate was therefore in favor of the defendants.

ND RAILROAD.

om this Office in a few
let form, with Litho-
ons; a full description of
ailroad, by an Engineer
gned to make the com-
eries of pamphlets—if
be induced to prepare
ll and complete descrip-
rent Railroads and Canals
States, which are, and as
hereafter completed. 5tf

ROTARY ENGINE.

now in use in various parts of
country, that is found to possess important
driving power, for *Saw-Mills, Cotton Factories, Sugar Mills and Machine Shops*, over the ordinary Piston

consists in economy in the
cost, and also in the cost of *fuel, repairs,*
and attendance. Wherever one of them has
put in operation by a person acquainted
with them, others have been ordered, and it
will continue to be so wherever they may be-
come known.

Orders for Engines, and Mill Machinery
addressed to this office, or to Mr. Joseph Curtis
31 Attorney-street, will be promptly attended
to. D. K. MINOR, Agent. tf

ATENT AGENCY OFFICE AT WASHINGTON.

WILLIAM P. ELLIOTT, Artist, for many
years employed in the *Patent Office*, will devote a
portion of his time to the preparation of papers and
drawings for applicants for Patents, and attend to
the procuring of patents for useful inventions with-
out the necessity of a journey to Washington; and
will give information by *mail*, as to the originality
of the names previous to applying for patents.

All communications must be free of postage. His
Office is in the room No. 10 Patent Office Buildings,
Washington, D. C.

Washington, April 20, 1838. Jy1—8t.

PATENT HAMMERED RAILROAD, SHIP, AND BOAT SPIKES.

The Albany Iron and Nail Works, have
always on hand, of their own manufacture, a
large assortment of Rail Road, Ship and Boat
Spikes, from 2 to 12 inches in length, and of
any form of head. From the excellence of
the material always used in their manufacture,
and their very general use for Railroads and
other purposes in this country, the manu-
facturers have no hesitation in warranting them
fully equal to the best Spikes in market, both
as to quality and appearance.

All orders addressed to the subscriber at the
works, will be promptly executed.

JNO. F. WINSLOW, Agt.
Albany Iron and Nail Works.

The above Spikes may be had at Factory
prices of Erastus Corning, & Co., Albany
Hart & Slosson, New York; Jas. H. Whitney-
& Co.; E. J. Young, Philadelphia; Wm. E. Co.
& Co. Boston. 1y

PATENT SAFETY FUSE.

For Igniting the Charge in Blasting Rocks, both in dry places and under water.

To those acquainted with and accustomed to using the Fuse, comment or description is unnecessary; to those who are not, we would simply observe, that it is an important invention to persons employed or concerned in Blasting, as by its use that hitherto dangerous operation is rendered as *safe* as the ordinary employme ts of the Farmer. It insures certainty, and effects an explosion as well under water as in the driest situation, adds much to the *force* of the blast, and by rendering the priming needle unnecessary, saves much time.

Numerous certificates from those who have tested the Fuse, might be given, but the following is deemed sufficient.

CERTIFICATE.

Having seen the Patent Safety Fuse for Blasting tested to our satisfaction, we cheerfully certify, that we are convinced that it saves much time and labor ---adds to the force of the blast—ensures certainty, and renders blasting perfectly safe. Besides, it is we think, CHEAPER than the common straw Fuse. For dry blasting it is a great improvement; but for blasting in wet ground, it is invaluable. Messrs. F. Hitchins & Co., contractors on the Erie canal, certify that they have been engaged in the Cornish mines, England, where the Fuse is exclusively used, and that it has never to their knowledge, caused a miscarriage. They confirm our above expressed opinion of its value. We make no doubt that it will soon be in universal use in blasting operations.

DAVID HAMILTON,
Superintendent repairs, Erie Canal.
W. J. McALPINE,
Assistant Engineer Erie Canal Enlargement.
J. HOUGHTON,
Engineer Cohoes Company.

COHOES, December 16, 1837.

The Fuse is manufactured by Baron, Bickford, Eales and Co. at Simsbury, Hartford Co., Conn., orders directed to them, or either of their agents, will be promptly attended to.

Agents for selling the Patent Safety Fuse.

David Watkinson & Co., Hartford, Conn.
A. G. Hazard & Co., 135 Front-st., N. Y.
Erastus Corning & Co., 361 South Market-street, Albany, N. Y.
E. F. & A. G. Smith, 29 Exchange-street, Rochester, N. Y.
H. Kingman & Co., Buffalo, N. Y.
Curtis & Hand, 16 Commerce-street Philadelphia, Penn.
Pratt & Keith, South Charles-street, Baltimore, MD.
G. R. Peake, Richmond Va.
W. B. Peake, Fredericksburgh, Va.

SHEET LEAD, &c.

THE Subscribers, Manufacturers of Sheet Lead, Lead Pipe, Red Lead and Litharge—have always an assortment in store, and for sale, at 175 Front Street, corner of Burling Slip.

CORNELL & TUCKER.

☞ Sheet Lead and Lead Pipe for Fortifications and Engineering, Milled any thickness and size to order.

New-York, March 10, 1838. 3m

PATENT RAILROAD, SHIP AND BOAT SPIKES.

*** The Troy Iron and Nail Factory keeps constantly for sale a very extensive assortment of Wrought Spikes and Nails, from 3 to 10 inches, manufactured by the subscriber's Patent Machinery, which after five years successful operation, and now almost universal use in the United States, (as well as England, where the subscriber obtained a patent) are found superior to any yet ever offered to market.

Railroad companies may be supplied with Spikes having countersink heads suitable to the holes in iron rails, to any amount and on short notice. Almost all the Railroads now in progress in the United States are fastened with Spikes made at the above-named factory—for which purpose they are found invaluable, as the withdrawn is more than double any common Spikes made by the hammer.

*** All orders directed to the Agent, Troy, N.Y. will be punctually attended to.

HENRY BURDEN, Agent.

Troy, N.Y., July, 1831.

*** Spikes are kept for sale at factory prices, by I & J. Townsend, Albany, and the principal Iron Merchants in Albany and Troy; J. I. Brower, 229 Water-street, New-York; A. M. Jones, Philadelphia; T. Janvier, Baltimore; Degrand & Smith, Boston.

P. S.—Railroad companies would do well to forward their orders as early as practicable, as the subscriber is desirous of extending the manufacturing so as to keep pace with the daily increasing demand for his Spikes.

1J23am H. BURDEN.

NEW ARRANGEMENT.

ROPES FOR INCLINED PLANES OF RAILROADS.

WE the subscribers have formed a co-partnership under the style and firm of Folger & Coleman, for the manufacturing and selling of Ropes for inclined planes of railroads, and for other uses, offer to supply ropes for inclined planes, of any length required without splice, at short notice, the manufacturing of cordage, heretofore carried on by S. B. Dudley & Co., will be done by the new firm, the same superintendent and machinery are employed by the new firm that were employed by S. B. Dudley & Co. All orders will be properly attended to, and ropes will be shipped to any port in the United States.

12th month 12th, 1830. Hudson, Columbia County, State of New-York.

ROBT. C. FOLGER.

23—tf GEORGE COLEMAN.

TOPOGRAPHICAL DRAWING.

For instruction in this and other branches of Drawing useful to the profession, apply at this office.

NEWCASTLE [illegible] TURING COMPANY.

[illegible] continues to furnish [illegible] of Newcastle, Del. [illegible] Steam Engines—[illegible] work and Brass and Iron [illegible] Mills connected with Steamboats, [illegible] Mill Gearing of every description, [illegible] (called) of any pattern and size, [illegible] also with wrought Tires; Bindings, [illegible] Boxes for Cars; Driving and other [illegible] Locomotives.

The works being on an extensive [illegible] orders will be executed with promptness [illegible] Communications addressed to Mr. [illegible] Dobb, Superintendent, will meet with [illegible] attention. ANDREW C. GRAY, President of the Newcastle Manufacturing Company.

Newcastle, Del. March 6, 1830.

Literary and Scientific Course of Instruction in Columbia College.

The students of this course will assemble in the College on Monday 1st October. Candidates for admission into the several classes will be examined on Friday, 28th September.

The object of this course is to afford to such persons as may not wish, or may not be prepared to enter upon the classical studies pursued in the college, full instruction in the mathematical, mixed, and physical sciences. For this purpose they are admitted to the instruction of the professors of these departments, and entitled to all the privileges of students in the regular classes. In addition, they have the facilities of pursuing the studies of English literature and history. The course has been planned with much care, as a preparation for the professions of the civil engineer, the architect, or the conductor of manufactures, and in order, more effectually to accomplish these objects, additional instructors are engaged, and arrangements made to teach the practice of engineering in the field, the use of instruments, the manipulations of practical chemistry, and the general, geometrical, and topographical drawing, &c. For these objects, great facilities are afforded in the increase of the apparatus, models and collections of the college.

A CARD.

A young man of unexceptionable character, having a desire to become practically acquainted with the business of a civil engineer, respectfully offers his services to any Railroad company as an assistant. He has some knowledge of mathematics, and is capable of repairing mathematical instruments, having served a short apprenticeship at said business, but is deficient in this measure by a preference for more active employment. Personal application at the office, or a letter addressed to the editor of the Railroad Journal will meet with due attention.

...ON OF TIMBER.

...ES of the invention of ... of London, by which ...ated throughout with a ... been found an efficient ... ordinary decay, the dry ... worm, having made such ... as have rendered the ...nd efficient, are prepared ...nts for the preparation of ... of the right of using the ...

...ation is believed to afford ... to wood, even in the ...dvantageous positions, a ... other which has yet been ...plicable to every case in ...ployed; and is particularly ... in the blocks with which ... the rails and sleepers of rail- ...nd planking of the gates of ...mber used in building docks ... the ravages of the worm ... and the piles and the beams ...s of hydraulic construction. ... process may be learned, and ..., on application to

... JAMES TREAT,
...gent of the Proprietors,
...o. 4, Wall st. New York.

...Certificates.

...d a number of the experi- ..., made for the purpose of ...sibility of Robert Bill's pro- ...ation of timber. In these ... by the addition of improve- ...d method, the perfect asso ... the separation both of its ...d moisture, could be effect. ...ery description of wood on ... was made, was thoroughly ... protecting material; and ...stance, (hemlock,) through ... injection was not complete, ... to exclude all access of ... proprietors have certificates of ...ood, prepared by Bill's method ... trials, for a space of five ... not this proof in their posses- ...sion, from the high antiseptic ... material they employ, that ...ted with it, cannot be sub ... ordinary causes of decay. The ... material to repel the gribble ... admitted, even when mere- ...sting; but when injected ... act as a perfect protection. ... N. Y. May 25, 1838.

...MES RENWICK, LL.D.
...ral and Experimental ...losophy and Chemistry.

...the British Government to ...bert Bill.

...d by Mr. Robert Bill was ... pit in his Majesty's yard, ... remained for five years, and perfectly withstood the fungus rot, whilst numerous other specimens were destroyed in a fifth part of that time. Other pieces were placed in the sea, by the master shipwright at Sheerness; and while wood, considered impervious to the gribble worm, was nearly eaten up, these remained untouched. Some specimens of timber, so prepared were placed in the earth at his Majesty's yard, Deptford one half their length being buried, and the other half protruding above ground, and pieces cut from the same tree, but unprepared, were put in competition with them; at the end of five years the former remained unchanged, the latter entirely destroyed. These experiments prove that the inferior sorts of timber may be made, at a small expense, far more durable than oak, or perhaps any known wood, from which great national benefits may be derived.

JOHN KNOWLES.
Secretary of the Navy Board.

GENEVA, N. Y. 15th June, 1838.

Having seen several specimens of Wood saturated with Coal Tar (so called,) and believing its use would greatly tend to the preservation from decay of all exposed timber, in structures for Railroads, Bridges or Canals, I recommend its adoption, and believe said wood would prove to be one of the greatest elements of economy that has ever been introduced into works where timber forms a chief material.

J. G. SWIFT,
Late of the U. S. Army

LOCOMOTIVE ENGINES.

The subscribers have for sale in England, on account of whom it may concern:

Two very superior light locomotive engines with tenders, &c. complete. These engines are suitable for roads, the superstructure of which are of wood with flat bars. They are of Bury's celebrated pattern, and would no doubt give great satisfaction:

ALSO—

Two 6 wheel engines of 11 tons weight, with fuel and water. These engines are of very superior workmanship. One of them could be delivered at New York, and the other in Philadelphia;

ALSO—

Two 4 wheel engines, warranted by the manufacturers not to weigh more than 7½ tons, with fuel and water. These engines are of a lot of 8 made at one establishment, of a particular pattern. Some of them are now running, and give very great satisfaction.

A. & G. RALSTON & CO.
South Front st. Philadelphia.

Who have on hand 300 tons of T rails, 2½ by 5-8, 2 by ½, 1¼ by ½, 1 1-4 by 1-4 and 1 by 1-4 flat bar rail road iron. Also Axles for Locomotives, cars, &c. &c. Orders for rail road iron executed as usual.

3 2m

NOTICE.

☞ We gave notice on the cover of Nos. 5 and 6, that the Journal would be sent, *after No.* 6, to those whose accounts were *unpaid*—that other numbers had been forwarded, with the bills made out, on the cover; we concluded to send also Nos. 7, 8 and 9, in order to give subscribers an opportunity to remit the amount of the bills forwarded with No. 6, before we resort to the unpleasant alternative of striking from our list the names of any of our early subscribers. We now forward Nos. *Eight* and *Nine*, in one cover, and renew our request that those whose accounts are unpaid, that they will, *without delay*, remit by mail the amount due. We had much rather receive *ten new* subscribers than lose an old one—but we cannot hereafter keep the one, nor receive the other, unless the subscription is paid.

List of Payments since No. 5, for 1st September.

C. J. Burckle, Oswego, N. Y. to July 1, 1839
J. L. Baldwin, Wilksbarre, Pa. July 1, 1839
W. D. Miller, Wetumpke, Ala. July 1, 1839
N. C. Osburn, Georgetown, D. C. July 1, 1839
J. W. Ewing, Camden, Ohio, July 1, 1839
R. C. Shute, do. do. July 1, 1839
C. Campbell & Co., Madison, Ga. March 13, 1836
C. W. Mills, Natchez, Miss. Sept. 1, 1838
C. H. Richmond, Milton, N. C. Jan'y 1, 1838
Elisha Johnson, Rochester, N. Y. July 1, 1839
D. O. Mascomber, Binghampton, N. Y. July 1, 1839
H. O. Alden, Belfast, Maine, Jan'y 1, 1839
Col. S. H. Long, Marietta, Ga. July 1, 1839
A. C. Morton, Goshen, N. Y. July 1, 1839
W. H. Wilson, Gettysburgh Pa July 1, 1839
A. & E. Denmead, Baltimore, Md. July 1, 1839
A. & E. Denmead, S. P. Tree, Ga. July 1, 1839
James P. Green, Wilmington, N. C. July 1, 1839
L. Bradley, Tiffin, Ohio, July 1, 1839
N. B. & H. Wood, Savannah, Ga. July 1, 1839
Benj. Aycrigg, Farranaville Pa. July 1, 1839
B. B. Wright, Havana, July 1, 1839
J. Aikins, Paulings, N. Y. July 1, 1839
Baron Mareschal, Washington D. C. July 1, 1839
Wm. Lake, Richmond, Va. July 1, 1839
B. H. Latrobe, Baltimore, Md. July 1, 1839
C. W. Wever, Baltimore, Md. July 1, 1839
James Burwell jr., Marietta, Ohio, July 1, 1839
G. Hawley, Albany, N. Y. April 1, 1839
J. Knight, Baltimore, Md. Feb. 10, 1840
J. M. G. Wright, Laurel Hill, La. July 1, 1839
C. W. Banks, Laurel Hill, La. July 1, 1839
E. F. Cushman, Troy, N. Y., April 1, 1839
E. A. Nichol, Reading, Pa. July 1, 1839
A. McIntyre, Albany, N. Y. July 1, 1839
J. C. Chesebrough, Pittsfield, Mass. July 1, 1839
J. F. Baldwin, Boston, March 8, 1839
J. L. Williams, Indianapolis, Ia. July 1, 1839
E. F. Johnson, New-Haven, Conn. July 1, 1839
S. A. Robelling, Saxenburgh, Pa. Nov. 1, 1839
Alex. Paris, Boston, Mass. July 1, 1839
A. P. Baker, Vicksburgh, Miss. July 1, 1839
Mattoon & Outhout, West Troy, N. Y. July 1, 1839
Ashbel Welch, Lambertville, N. J. July 1, 1839
O. S. Chapman & Co. Hinsdale, Mass. July 1, 1839
Wm. F. Ketchum, Buffalo, N. Y. July 1, 1839
A. & G. Ralston, Philadelphia, Pa. July 1, 1839
C. A. Burton, Galena, Ill. July 1, 1839
M. Wadleigh, Galena, Ill. July 1, 1839
H. G. Gilbert, Galena, Ill. July 1, 1839
W. B. Gilbert, Galena, Ill. Oct. 1, 1839
Octavius Blanc, Stephenson, Ill. July 1, 1839
L. G. Dutton, Springfield, Ohio, July 1, 1839
T. H. Dewitt, Lynchburgh, Va. July 1, 1839
Thos. J. Cotebings, Canton, Miss. July 1, 1839
P. H. Hoffman, Baltimore, Md. July 1, 1839
R. R. Company, Petersburgh, Va. July 1, 1839
G. Geddes, Geddes, N. Y. January 1, 1839
Canal & Railroad Co. Charleston, S. C. July 1, 1839
Wm. Jackson, Newton, Mass. January 1, 1839
Wm. H. Stockton, Marietta, Ga. July 1, 1839
A. Herbert, Marietta, Ga. July 1, 1839
Mr. Haupt, Gettysburgh, Pa. Nov. 1, 1839
Rogers Ketcham & Grosvenor, N. Y. Jan. 1, 1839
Capt. W. Turnbull, Washington, D. C. July 1, 1839
Lew. Styer, New Brunswick, N. J. April 1, 1839
R. T. P. Allen, Portland Harbor, N. Y. July 1, 1839
M. Robinson, Philadelphia, Pa. Jany 1, 1839
O. Allen, Norwich, Conn. July 1, 1839
A. Andrews, New Salem, Mass. July 1, 1839
F. C. Mills, Mount Morris, N. Y. July 1, 1839
S. M. Boughton, Poughkeepsie, N. Y. July 1, 1839
J. E. Jervis, New York city, July 1, 1839
L. N. Bowlsby, Adrian, Michigan, July 1, 1839
P. H. Ogilvie, Galena, Ill. July 1, 1839
W. H. Lyon, " July 1, 1839
W. W. Roberts, Cattawissa, Pa. July 1, 1839
J. P. Monrow, Rome, N. Y. Dec. 1, 1839
C. McAlpin, Cohoes, " July 1, 1839
J. W. Crane, Schenectady, " July 1, 1839